Pacific Archaeology

– RESEARCH REPORT –

The archaeology of the Kapiti Coast

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Abstract

Between 2013 and 2017 the New Zealand Transport Agency (NZTA) constructed an 18 km expressway along the Kapiti Coast, north of Wellington, called the MacKays to Peka Peka Expressway. The project is abbreviated to M2PP. A large archaeological programme was undertaken during the construction earthworks. 233 new archaeological sites were recorded during the M2PP archaeological programme. The majority of these sites were shell middens. No evidence of gardening was revealed. The data showed that the physical environment was the primary factor in determining both the nature of archaeological sites present and their location. The physical environment of the Kapiti Coast underpinned the subsistence economy – the environment both created and limited the resources and opportunities available to the people.

***Keywords*:** Coastal dunes, expressway, archaeological monitoring, middens, faunal analysis

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1. Introduction

The Kapiti Coast is located on the southwest of New Zealand's North Island. It is characterised by a long expanse of dynamic coastal dunes in a narrow band between the coast and an inland wave cut cliff. Two major rivers, the Waikanae and the Otaki, contribute water-borne material to coastal progradation. Until 2013 archaeology on the coast had been comprised of small scale localised investigations by archaeological consultants, usually development-based, and from research and data contributed by early archaeologists and ethnographers, often based on Māori oral traditions (for example, Carkeek, 1966 and Adkin, 1948). In 2013 the New Zealand Transport Agency (NZTA) received consent to construct an 18 km expressway along the Kapiti Coast, north of Wellington, known as the MacKays to Peka Peka Expressway (M2PP). The archaeological programme of the M2PP project contributed significant new data, and enabled the development of a regional archaeological synthesis.

2. Historical and archaeological context

Archaeological site recording has taken place on the Kapiti Coast for much of the 20th century, but observations commenced prior to this. Field (1891) described changes in the appearance and geomorphology on the coast in a forty-year period based on his own observations, made between 1851 and 1891. He noted that in 1851 a constabulary station (police station) was located near the mouth of the Waikanae River, but by 1868 the river had changed course and washed part of the station away. Field also observed and described the shell middens in the area.

Adkin (1948) is a key source of data for archaeology further north of Kapiti, at Horowhenua. In his landmark book *Horowhenua* he reported on his years of observations and analysis of sites in Horowhenua as far south as Otaki. Two aspects make Adkin's data of particular significance: firstly, that he spoke with Māori in the area in the 1920s, and recorded place names and traditions of the area, and secondly, he observed and recorded many sites from the 1920s onwards, before sites were obscured or destroyed by the more intensive farming techniques of the 1950s onwards.

Beckett (1957) wrote of observations made in the 1920s and earlier, prior to substantial development of the area. Beckett uses the term "pa" both within the archaeological definition of the term to describe defended settlements and also to describe undefended settlements or kainga. Therefore, care needs to be taken when reviewing Beckett's observations. However, Beckett's notes provide invaluable data on sites that are now completely destroyed, such as occupied villages in the vicinity of Kapiti Road.

In 1966 Carkeek compiled a history of Māori occupation of the Kapiti Coast based on traditional accounts, detailing important historical events like the Kuititanga battle. He included a specific chapter on the middens of the coast. A major part of his book is a list and description of place names of the coast, based on traditional evidence, and maps showing the locations of these places.

There has been sporadic archaeological site recording in the Kapiti-Horowhenua region from the 1920s through to the present. Only one planned systematic survey had been undertaken prior to the M2PP programme, by Colin Smart and students of the Wellington Teachers College in 1959-61 (Smart, 1962). Smart was specifically sampling and analysing middens, so arguably was not concentrating on

other possible sites. However, like Adkin, Smart also noted the environmental relationship between the dunes and the midden sites.

Most archaeological site recording since the 1980s has been reactive and development driven, due in part to the requirement of Assessment of Environmental Effects introduced in the *Resource Management Act 1991*.

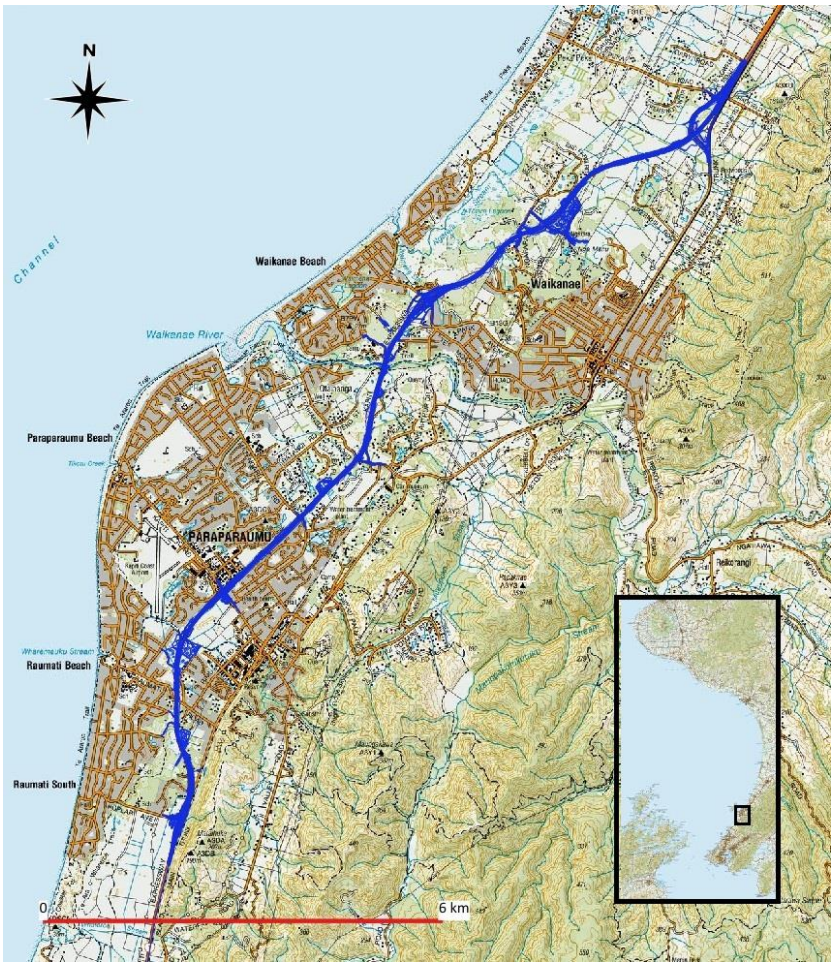

Figure 1: Location of MacKays to Peka Peka Expressway, Kapiti Coast. New road shown in blue.

2.1. Environment & Geomorphology

The physical environment of the Kapiti Coast is an important factor in understanding and interpreting the archaeological record, as the environment directly determines the nature of human activities on the coastal dunes, and shapes opportunities and limitations. As McFadgen (McFadgen, 1997: 6) states:

> "People in pursuit of their everyday lives exploited and changed their environment to meet their needs for food, clothing and shelter and their culture was, in turn, conditioned by it. The flow of information in this approach is two way: archaeological remains provide an historical perspective for the landscape as it appears today; and understanding the

> natural and cultural processes which have shaped the landscape is important for the interpretation of human and natural history".

An important aspect of the M2PP Expressway route was that, because it had been the subject of a roading designation for over 50 years, the route prior to construction was a corridor of unmodified land within a modified (in parts highly modified) landscape. The Kapiti Coast is situated at the southern extent of a long band of coastal dunes on the southwest coast of New Zealand's North Island, running continuously north from Paekakariki to Taranaki. The topography of the Kapiti Coast is characterised by a relatively narrow flat coastal shelf largely covered in sand dunes and wetlands, in front of inland hills. The Waikanae and Waimeha Rivers have formed a wide floodplain.

North of the Waikanae River the coastal dunes are a series of high parabolic dunes, interspersed with large areas of interdunal peat wetlands. South of the Waikanae River the inland wave cut cliff forms an abrupt steep edge to the coastal dunes. The dunes here are modified and unmodified linear dunes, separated by low lying interdunal peat swamps and wetlands. The dunes along the entire coast (north and south of the river) have formed during successive dune building phases.

The dune sequence on the Kapiti/Horowhenua Coast was first identified by Cowie (Cowie, 1963) who documented dune phases in the vicinity of the Manawatu River mouth. Cowie noted that the oldest dunes are further inland and the younger dunes, which are sometimes deposited over the top of older dune formations, are closer to the coast. Cowie's work on dune phases was subsequently expanded on by McFadgen (McFadgen, 1997: 8) who discussed the dune sequences in relation to the distribution of archaeological sites on the Kapiti/Horowhenua Coast. McFadgen postulates four dune building sequences, commencing about 6500yrs BP, through to the most recent sequence dating to about 150 yrs BP. McFadgen postulates that the two most recent dune building phases are seismic in origin, but this hypothesis needs to be tested (McFadgen, pers.comm. to author July 2011). As noted, there are extensive areas of former wetland interspersed between the dunes. The wetland areas are significant in terms of human occupation as the archaeological data suggests they would have been rich sources of food and raw materials, including birds, eels and plant species.

The MacKays to Peka Peka Project ecologist (Matiu Park, pers. comm. to author May 2011) made observations concerning the wetlands in the vicinity of the proposed expressway alignment. He suggests that the water table has dropped by about 0.5m from historical levels as a result of artificial swamp drainage and water abstraction. He notes that most wetlands within or near the expressway alignment are ephemeral, that is, they have standing water in winter but are dry in summer. He observes that many of the wetland areas on the coast investigated as part of this Project indicate that they consist of shallow lenses of peat in dune depressions between windblown dunes.

An important piece of geomorphological data was obtained by the author during the archaeological monitoring programme, which supports a hypothesis of uplift during the time of human occupation. The Project Archaeologist observed gleyed sand in the base of many of the low-lying swales located within the dunes. The presence of this gleyed sand is significant. Gleying of sand is a chemical process of change that occurs when sand is waterlogged for a long period. This data suggests the presence of previously permanent wetlands around the high dunes in the locations where the gleying was observed.

These areas are no longer permanently wet; as the M2PP ecologist noted, many of them are now ephemeral.

2.2. M2PP archaeological programme

The Project Archaeologist completed an overall archaeological assessment of the project in February 2011 (O'Keeffe, 2011). This assessment developed a predictive model for the location and occurrence of sites across the scope of the project, based on existing data. The Project Archaeologist then developed a series of more detailed zone assessments, detailing the known and probable archaeological resource within the project zones, and outlining required archaeological work.

The Project Archaeologist engaged Southern Pacific Archaeological Research (SPAR) to undertake various aspects of the archaeological programme, as will be discussed later in this report. Initially SPAR staff member Chris Jacomb and the Project Archaeologist also developed a research strategy (Jacomb and O'Keeffe, 2012), which set out the research questions and priorities driving the archaeological field programme to be undertaken for M2PP.

The analysis and research undertaken before construction contributed to a predictive model. This model contributed to project scoping, by determining the probability and likely location of sites. The model postulated indicated that there was a high probably of sites being exposed by construction work, but that these sites were unlikely to be visible on the surface. Further, sites were more likely in areas of high dunes. On the basis of this knowledge, the archaeological monitoring programme was co-ordinated with the expressway construction programme so as to maximise the potential for archaeological information.

The archaeological programme for M2PP occurred in two distinct phases, each with its own methodology and objectives:

- Phase 1 was a series of detailed archaeological investigations undertaken prior to construction earthworks. This work was managed by Southern Pacific Archaeological Research. The pre-construction investigations took place between May and September 2013. Investigations in phase 1 focussed on areas of high probability of site occurrence, as identified in the predictive model. These areas were investigated using mechanical diggers and by hand. Seventeen sites were located and investigated. Faunal analysis of these sites was undertaken by SPAR at Otago University.
- Phase 2 was monitoring of construction earthworks during the construction phase of the expressway, which took place between October 2013 and April 2016. As well as monitoring all earthworks in sand dunes, the Project Archaeologist monitored earthworks in other physical environments (river flood plains and former wetlands) to test the assumptions of the predictive model in relation to site presence and the physical environment.

Iwi monitors were on site for all archaeological investigation and monitoring work in all phases of the archaeological programme – their presence, company, input and advice were significant gifts to the work. A further 216 sites were recorded and investigated.

2.3. Monitoring methodology

M2PP was constructed as a "design and build" project, which means much of the designing of the road and its component pieces (bridges, culverts etc) occurred during the construction phase. Earthworks generally occurred in two steps: stripping of topsoil for stockpiling for reuse, and bulking out of the underlying sand. Topsoil stripping was undertaken by mechanical excavators using flat edged clean up buckets, and the operators carefully removed the overlying topsoil.

The topsoil stripping method was generally advantageous to the archaeological programme. Because the archaeological sites were usually located on the interface between the topsoil and the underlying sand, this method allowed for good retention and visibility of the archaeological resource. The visual distinction between the yellow-brown sand and darker archaeological features within the sand allowed clear observation of the archaeological features. Topsoil stripping therefore allowed for good retention and visibility of the archaeological resource, and potential archaeological features were easy to observe during monitoring.

The Project Archaeologist (or her nominated colleague) was on site for all construction earthworks within sand dunes. She observed the mechanical diggers stripping topsoil and stopped the diggers when apparent archaeological material was observed. The sites were investigated either by hand or occasionally by mechanical digger under the Project Archaeologist's direction. The operators of Goodmans Contractors Ltd are applauded for their skill and commitment to the work: they quickly came to recognise potential archaeological features, and the Project Archaeologist could trust them to stop when necessary if she was working on an adjacent site.

Field numbers were assigned to newly recorded sites (temporary field numbers were used to avoid potential duplication with already recorded sites. NZAA numbers were later assigned once site duplication and lumping/splitting issues had been resolved). Sites were described and photographed. A plan was drawn where required. Most midden sites were sampled, and a standard 10 litre bulk sample was taken (or multiple 10L bulk samples for larger sites).

2.4. Archaeological Results

Archaeological recording for the M2PP programme included both detailed excavation and bulk sampling of some sites (undertaken by the SPAR team during the preconstruction programme), and comprehensive recording and sampling during monitoring of the construction programme. Of the total 233 sites recorded during the M2PP programme, 81% of the sites (189) were middens, or middens in association with some other archaeological feature. This data shows the predominant subsistence resource available to people living on the coastal dunes. The coastline extending north from Paekakariki is a long uninterrupted sandy shore, with rich shellfish beds and marine resources. These marine resources would have been easy to access by foot from the flat safe beach, or by launching a waka from any point along the coast.

3. Recorded sites: relationship with the environment

As noted, the physical environment of the Kapiti Coast underpinned the subsistence economy – the environment influenced the resources and opportunities available to the people. This in turn determined the types of archaeological sites present, and where they are found across the landscape. The primary resource on the coast is the rich kaimoana in plentiful supply along the long unbroken expanse of sandy coastline. Thde dynamic actions of the Waikanae River, the wind and Kapiti Island has resulted in bands of wetlands between the dunes, with the wetlands providing additional resources of birds, eels and flax.

The environment also determined what types of sites are and are not present. The expansive coastal resources resulted in large number of middens, of varying sizes. The dynamic and unstable dunes appear to have precluded gardening, or the construction of earthworks sites (pits, terraces, or house platforms). Archaeological work along the coast shows that due to the dynamic nature of the unstable dunes, sites can be found several metres below the ground surface. Middens especially can be inundated by windblown sand.

Figure 2: Example of midden buried by windblown sand. Petersen (2007:4).

3.1. Dunes, forest and wetlands

As noted, palaeoenvironmental research indicated the probable vegetation present at the time of occupation was a broadleaf and conifer forest. The data also suggests possible small-scale and localised clearance by people. It is also probable that no large-scale forest or vegetation clearance was undertaken by the people. As previously noted, the author observed during construction earthworks the immediate wind-induced deflation and movement of the dunes when the vegetation was removed; this would also

have been the case in the pre-European occupation period and would have been a major environmental hindrance for the occupants. Lack of large-scale clearance is supported by evidence of types of human activity derived from the archaeological data: firstly, as people appear to have not been gardening, they had no need to remove the vegetation, and secondly the forest provided desirable resources.

The wetlands are an important factor for the subsistence economy of the coastal dunes, both for the resources they contain, and, more importantly, because they would have provided navigable access routes along and within the coastal dunes. Beckett was told in the 1920s that a canoe passage was said to exist from Paekakariki almost to Waikanae (Beckett, 1957: 359). Beckett notes he found the decayed remains of two canoes near the railway lines in 1924 and 1930.

The Project Archaeologist paid particular attention to the areas of wetlands during the archaeological investigations, to explore the hypothesis that the waterways were a transport route. As noted, gleyed sand was observed at the base of dune swales, usually within a metre of the ground surface, and as noted, the presence of this gleyed sand suggests the presence of standing or running water at some point. Drainage for farming has dried many of the dune areas. However, gleying beneath now dry surfaces was observed by the author throughout the parabolic dunes north of Te Moana Road, in areas where there would be no purpose in drainage for farming as the varying topography precludes large flat areas for cropping or large-scale grazing.

Another possible agent of change is seismic uplift causing widespread drainage of waterways. If such seismic uplift has taken place, it is within the period of human occupation of the coast, so since the early to mid-16th century, based on archaeological sites being located on dunes beside previously navigable waterways. This theory of seismic uplift needs to be tested, and is outside the scope of archaeology. However, the correlation between archaeological site locations and previously navigable waterways (as attested by presence of gleying) is noted. The author postulates that navigable waterways were a significant factor in both the location and size of sites on the coastal dunes – transport via waka would have allowed carriage or large amounts of kaimoana from the beach to the dunes for processing.

3.1.1. Site distribution and landform

The author analysed site distribution and landform, though utilizing LiDAR and topographic data in her GIS. LiDAR data emphasises the landscape features: the coastal dunes and the inland hills are apparent. The distinct band of parabolic dunes north of the Waikanae River is also apparent.

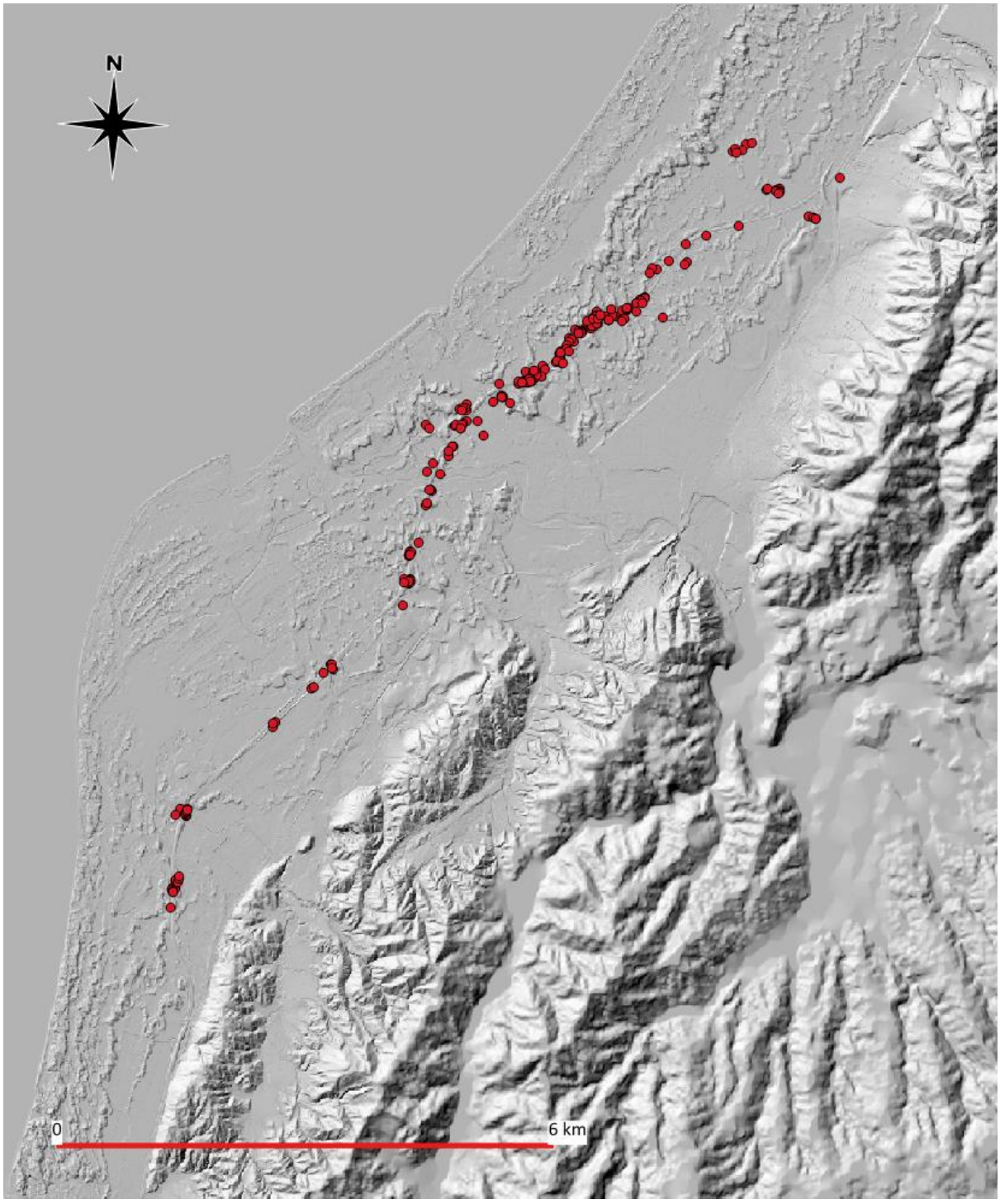

Figure 3: Archaeological site distribution and LiDAR data. Red dots: M2PP data

This data is limited by the fact that only the site distribution along the expressway alignment is shown. However, this data set is considered robust in that the entire expressway alignment was monitored by the archaeologist, virtually every site present was recorded, and apparent absence of sites in the distribution pattern is based on an actual absence of sites on the ground.

The LiDAR data suggests a specific relationship between sites and landforms. In the LiDAR images several factors stand out:

- The dominance of the band of parabolic dunes north of the Waikanae River as a landscape feature
- The high density of sites within these dunes
- The linear alignment of the dunes south of the Waikanae River contrasted with the more meandering pattern of the parabolic dunes north of the river
- The strong locational relationship between sites and the dunes, where the majority of recorded sites are located on dunes
- The relationship between site locations and previously navigable waterways

This landscape relationship between sites and dunes was further explored by comparing site locations with detailed GIS-based contour data. Important aspects of the relationship between sites and the landscape are revealed by this contour data. The data clearly shows the locational relationship between the sites and the topography:

- Sites are only located on dunes
- Sites are on dunes accessible from formerly navigable wetlands or rivers

In particular the density of the sites in the parabolic dunes north of the Waikanae River is shown in detail. The specific relationship between the sites and these parabolic dunes is clearly expressed in this contour information. Figure 4 shows another area of the parabolic dunes. In this image it is seen that the sites are both on the dune crests and down the slopes of the dune faces, and on all faces not just north facing slopes (presumably to shelter from wind coming in various directions). The sinuous nature of the dunes means that there was always easy access to a navigable waterway.

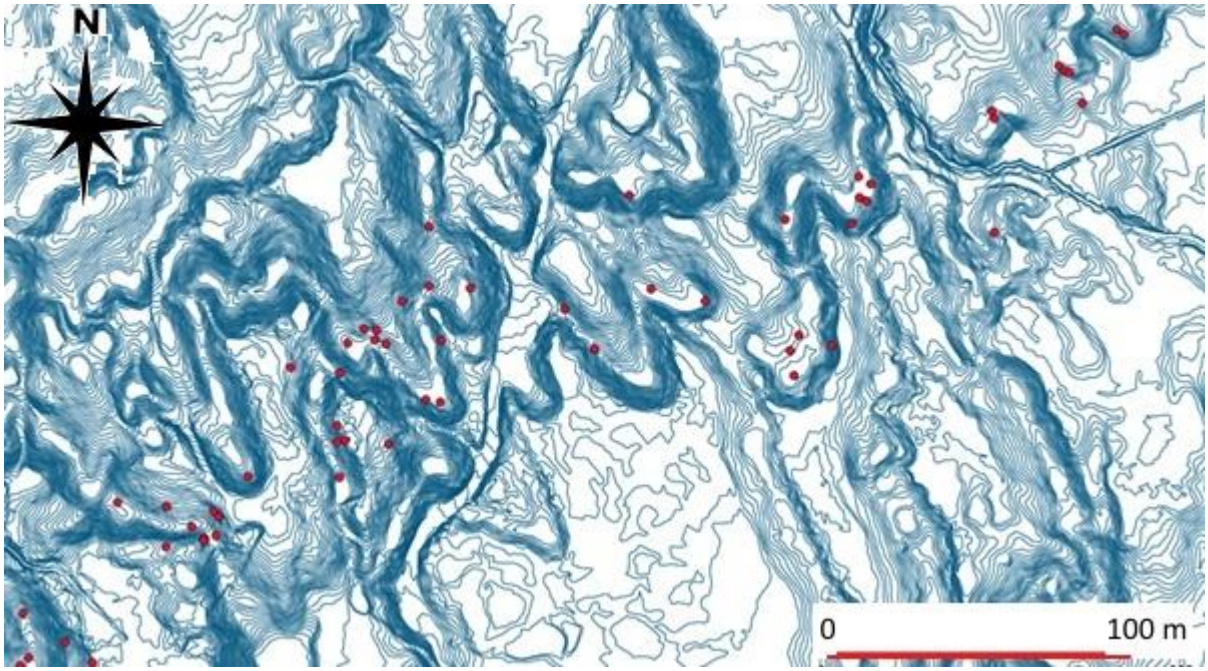

Figure 4: Contour data and recorded archaeological sites – selected area between Te Moana Road and Ngarara Road

Three sites have been selected to examine this relationship between site location and topography: R26/529, R26/567 and R26/641. These three sites have been chosen to represent examples of three landscapes: R26/529 in the lower linear dunes south of the Waikanae River, R26/567 within the parabolic dunes north of the Waikanae River, and R26/641 in the low dunes south of Peka Peka Road.

3.1.2. Site/wetland relationship 1: R26/529

R26/529 was a midden located on the high dunes immediately north of and beside Raumati Road, as seen in Figure 6.

The site was located on the north facing internal side of an oval shaped dune, down slope and approximately 5m from the dune crest. There was a former wetland on either side of the dune, as seen in Figure 7.

The site was comprised of one lens of shell. It contained whole and broken shell, and the species present included tuatua, gastropod, mactra, and dosinia. The site was half sectioned by machine down the fall of the slope, to gain information about the extent of the site. The shell lens covered an area of 1m x 1.5m, and was about 20cm deep.

The site location appears to have chosen for specific benefits. Easy access to the adjacent wetland could have provided a water-based transport route to the coast and through the surrounding dunes.

Figure 5: Location of three landscape relationship examples

Figure 6: Location of R26/529

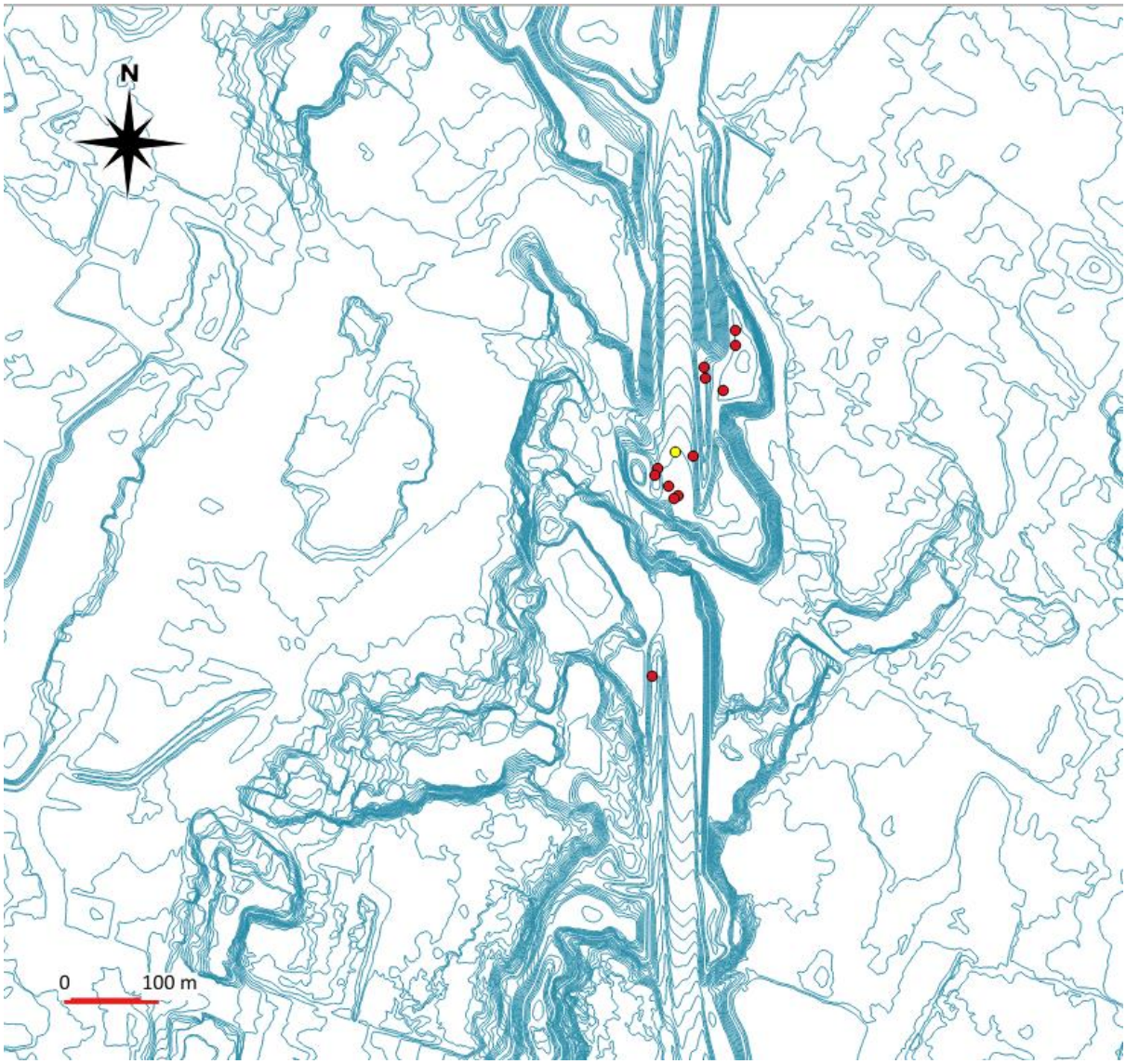

Figure 7: Topographic location of R26/529 (seen as yellow dot)

Figure 8: R26/529

3.1.3. Site /wetland relationship 2: R26/567

R26/567 was an area of middens and ovens located on the west side of the high dune belt north of Te Moana Road, as seen in Figure 9.

Topographically the site was tucked into the angle formed between the main dominant dune belt and a lateral dune extending north-west from the main dune belt, as seen in Figure 10. The site was located beside an extensive wetland, and the site itself was placed within a small "beach", formed by the curve of the dune at the water's edge.

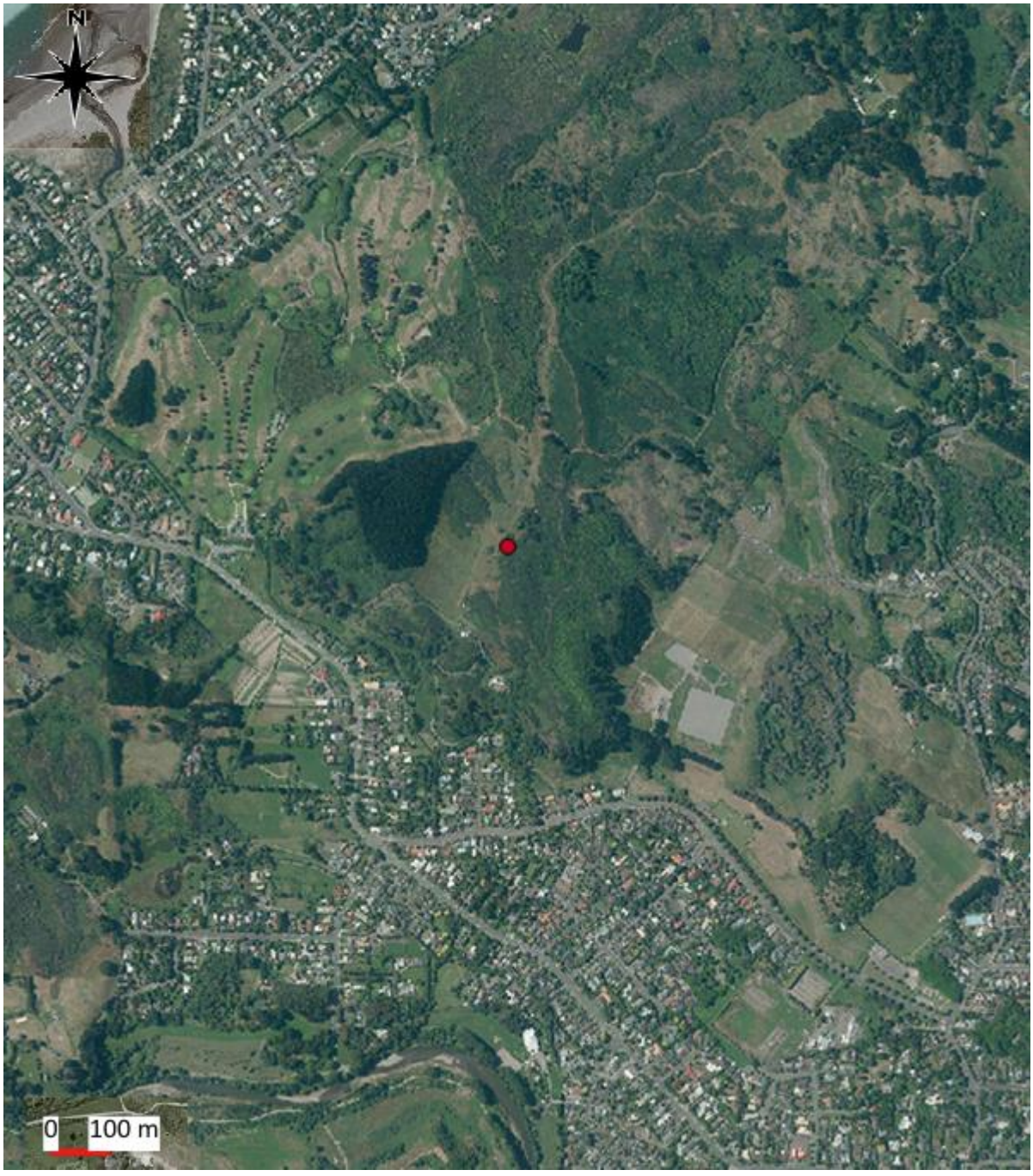

Figure 9: Location of R26/567

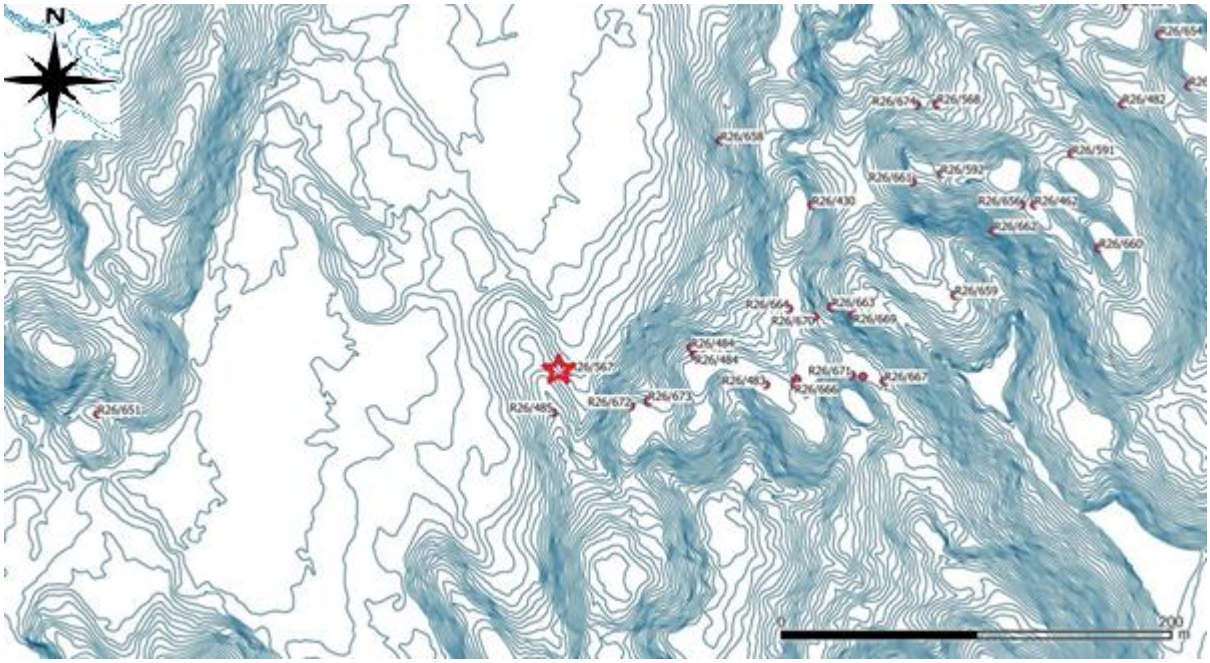

Figure 10: Topographic location of R26/567 (seen as a star)

The site was an extensive area of middens and ovens, covering some tens of square metres. The midden was in several areas, including one area of about 30m^2 including several dense shell pockets and one area of oven rakeout. Fire features were scatted around the shell, suggesting fires for cooking or smoking the food.

The site was investigated using a machine excavator and by hand. A machine dug trench was placed along the main length of the deposit (from north-west to south-east), and also two lateral trenches were run up the dune slope from each end of the main trench, to understand the stratigraphy of the deposits and the dune in relation to the fall of the slope. No archaeological features were recorded up the lateral trenches, except for the edges of the deposits exposed along the main trench.

The largest shell deposit was an irregular surface deposit, over an area of approx. 30 m^2. Shell was exposed in various places by the machine bucket; areas of both whole and broken shell were visible across the surface. There was a dense deposit of crushed shell and oven rake out at the eastern end of the machine-cut section, small pockets of shell scattered along the section, and several dense pockets of shell along the section.

One definite and two probable ovens were revealed on the east side of the site, adjacent to the middens; other more amorphous dark areas could also have been ovens. The definite oven was half sectioned by hand and found to be bowl shaped. Two obsidian cutting tools were found beside this oven, one made from black Bay of Plenty obsidian which appeared to have been shaped to fit the user's hand, and a second piece of iridescent grey obsidian thought to originate from the Taupo Volcanic Zone. Both tools had edges that had been worked.

Figure 11: R26/567 - General overview of location (looking south-west)

Figure 12: R26/567 – north facing section

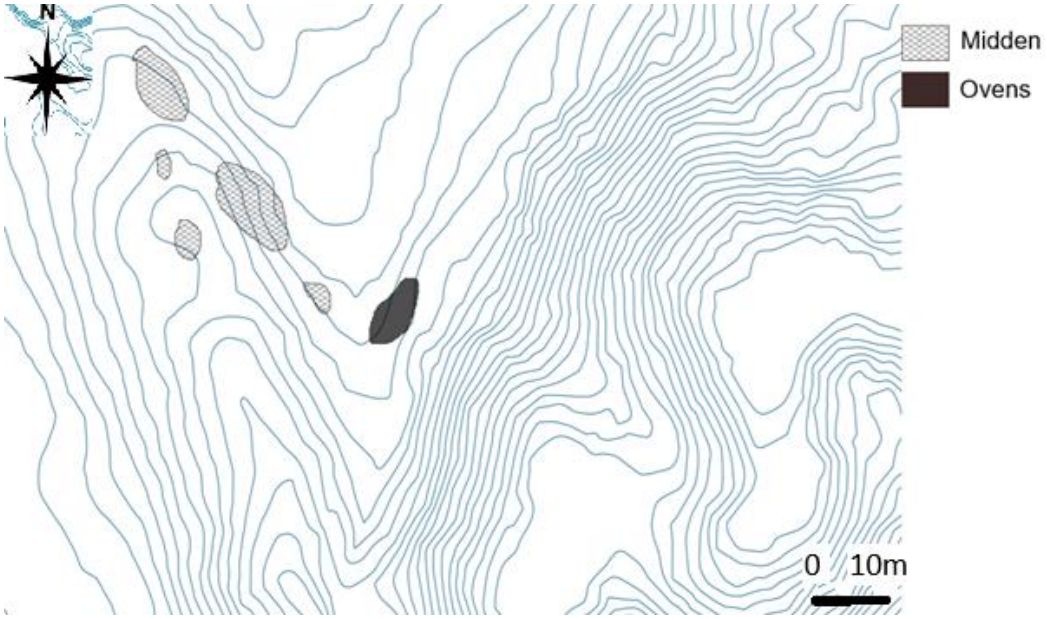

Figure 13: Plan of R26/567

Figure 14: R26/567 – excavated midden sections. Left: Hand excavated section through fragmented midden deposit, stadia rod increments 20cm. Right: Hand excavated section through fragmented and whole midden deposit, stadia rod increments 20cm.

Figure 15: R26/567. Left: hand sectioned midden deposit, stadia rod increments 20cm. Right: hand sectioned oven, stadia rod increments 20cm.

3.1.4. Site/wetland relationship 3: R26/641

R26/641 was a large midden located on the broad low dunes to the east of the band of parabolic dunes north of the Waikanae River, as seen in Figure 16.

Topographically the site was located on the surface of a broad, low dune, immediately adjacent to a large former wetland, as seen in Figure 17. The low elevation and wide broad surfaces of these dunes are contrasted to the high, steep sided dunes in the parabolic dune belt, some 300m to the west.

Figure 16: Location of R26/641 (red dot)

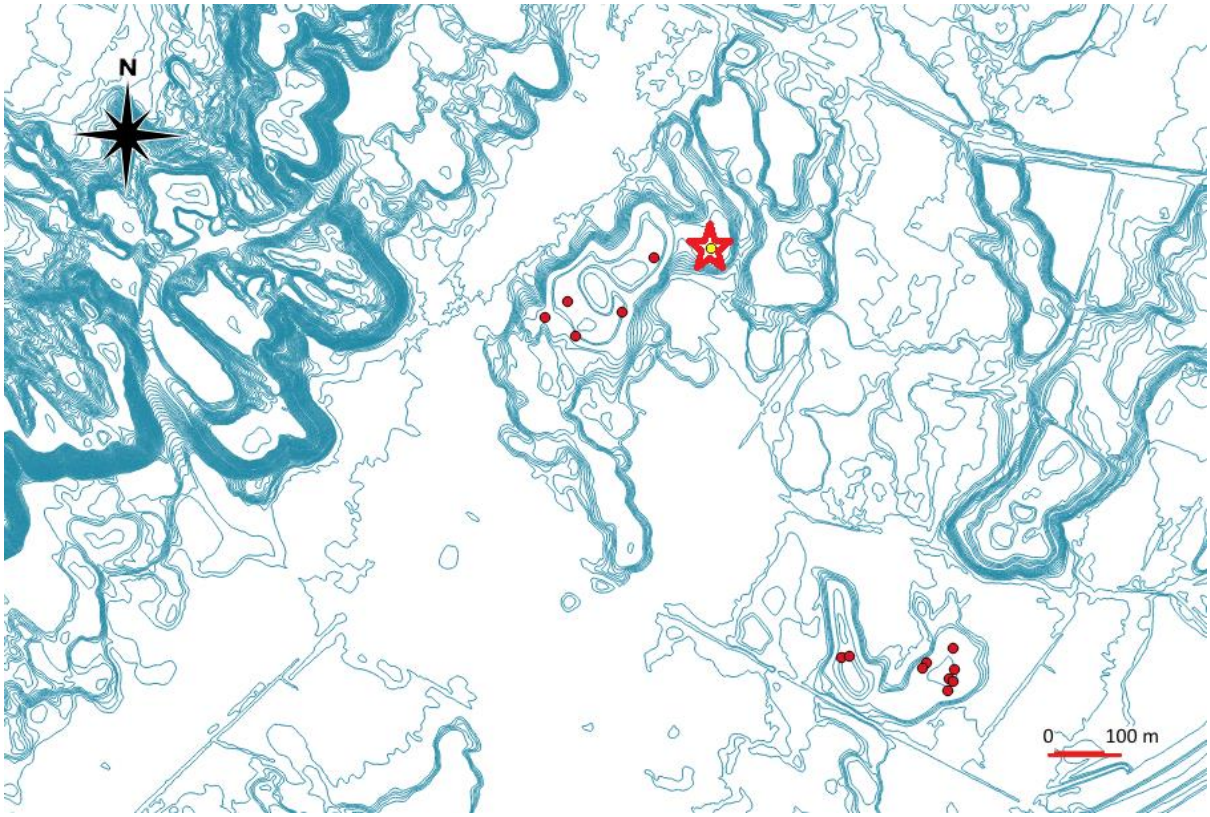

Figure 17: Topographic location of R26/641 (seen as a star)

The site was comprised of several areas of middens, extending over an area of about 70m^2. The site was investigated by hand and parts trenched by machine. The shell was dense, and of varying depth, up to 10cm deep. Species present included spisula, tuatua and dosinia. One area was predominantly spisula. There were pockets of whole and broken shell. The shell in the upper part of the deposits was very fragmented; this is possibly an effect of vehicles driving over the dune when the adjacent power pylons were installed. The underlying shell was whole and intact. The site also contained two probable ovens, represented by dark, greasy sand, without any oven stone. Each oven feature was about 1m^2, and about 1m apart.

Figure 18: Plan of R26/641

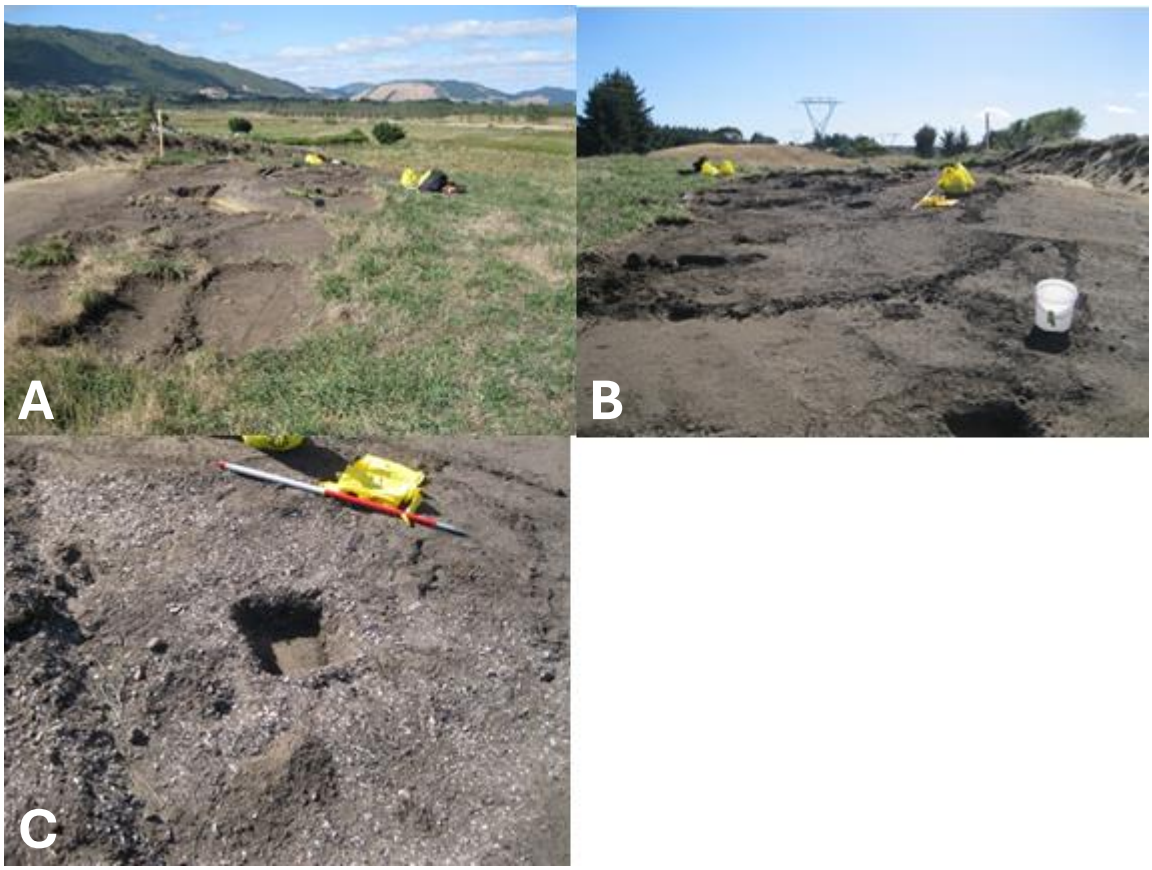

Figure 19: R26/641. A: commencing stripping, showing surrounding topography. B: stripping dune surface. C: sampling midden on dune surface.

The site's location may have allowed the occupant easy access to the adjacent navigable waterway. In terms of the coastal shelf between the coast and the inland hills, this site is well inland (about 1.8km from the coast), and near to but not immediately beside the parabolic dunes that would have contained wetland resources. As no palaeoenvironmental samples were obtained from the middens on these lower dunes, the vegetation on them and resulting available resources is not known. However, an advantage for the occupants of this particular site location is that it was adjacent to a natural channel running parallel to the coast through the dunes to the north, allowing easy navigable access.

As noted, three sites were selected to examine the relationship between site location and topography: R26/529, R26/567 and R26/641All three sites used to demonstrate the relationship between sites and topography share the same locational characteristics: they are near previously navigable waterways, and on elevated dunes.

The northern zone middens were in marked contrast to central and southern zone sites in several aspects:

- They were of all sizes (large to small), but the large sites only occurred here.
- They tended to be multi species, including both multiple species of shellfish, plus fish, bird and mammal
- They were often located on the slopes of the high dunes as well as the dune crests; sites in the southern zone were usually just locate don dune crests
- The relationship between navigable wetlands and site locations was particularly marked in the northern zone
- There is a clear preference for the high parabolic dunes north of the Waikanae River. This preference is demonstrated through the large number of sites present here, the fact that the largest middens occur here, and that the middens in this area have greater species diversity than sites south of the river. The reasons for this preference would appear to be environmental advantage – easy access to the coastal resources and easy access to the dunes through the navigable waterways, but mainly diversity of resources available at the dunes and wetlands.

4. Archaeological evidence

4.1. Middens: Historical observations

The dominance of shellfish in the subsistence economy of the Kapiti region has been noted by observers for many decades. Field (1891) described changes in the appearance and geomorphology on the coast in a forty-year period based on his own observations, made between 1851 and 1891. Field also observed and described archaeological sites. In particular, Field (1891:562) described a site on the south side of the Waikanae River:

> "A sandhill 30ft to 40ft high, which formerly stood almost behind the hotel, and which from the immense amount of pipi-shells which it contained, formed a very conspicuous landmark for entering the river, has been entirely blown away, and its contents are now scattered over nearly flat ground".

Field also attested to the dynamic nature of the sand dunes: "At the back of the hills a considerable extent of what was good grass-land is now buried under sand" (1891:563). Field also noted that with the shifting dunes:

> "...many long-buried articles have come to light.... kitchen middens and immense numbers of old cooking stones...an ancient Māori cemetery.... very many moa bones.....large numbers of obsidian flakes, adzes (more or less perfectly finished) of greenstones, chert, obsidian, and hoop-iron, intermixed with other articles of unquestionably European origin" (Field, 1891: 563).

Best (1918) undertook a descriptive analysis of the shell middens from Porirua in the south to Waikanae in the north. Best discussed the middens which he observed on the sandhills that extended from south of Paekakariki to "far up the coast". Best observed "shell-middens and village-sites", without specifying the evidence for these villages. Best also observed that wind had deflated and moved the dunes, causing inundation or exposure of the middens.

Best's observations are of particular value, as he was making these observations before the sites and the land were extensively modified by farming and urban development. Best observed the majority of the middens were comprised of tuatua (which he calls *Mesodesma subtriangulata*), but occasionally the dominant shell type was *Dosinia anus*.

Adkin (Adkin, 1848) also made observations on archaeological sites. As noted, Adkin is a key source of data for archaeology further north of Kapiti, at Horowhenua, where his observations were based on contemporary conversations and observations. Many of Adkin's observations on the nature and distribution of sites can be extrapolated further south to the Kapiti area; however, an important archaeological research theme is to test and validate some of Adkin's Horowhenua-based hypotheses on the Kapiti data. A key observation made by Adkin was division of the Horowhenua middens into two groups (Adkin, 1948: 40):

- A group of younger middens, in a band on the present foredune closest to the sea. These are looser and more widely scattered, are almost exclusively tuatua, and have practically no artefacts associated with them.
- A group of older middens further inland, in dense compacted heaps, with many artefacts of bone and stone.

Adkin calls the shells "pipis" but applies the scientific name *Amphidesma subtriangulata*, which is in fact the name for tuatua. Adkin interprets the different middens as different site types: the coastal middens are single phase food gathering sites and the denser inland middens with artefacts are "centres of community activity" (Adkin, 1948: 40). It is reasonable for Adkin to assume the middens on the coastal dunes are younger, as these dunes are geologically more recent.

This pattern of younger middens on the foredune and older middens further inland may well be repeated on the Kapiti Coast. This is based on inference, and requires testing and validating by observation and radiocarbon dating. A key research theme for archaeological work on the Kapiti Coast is, therefore, to see if Adkin's hypothetical differentiation of Horowhenua midden types is also seen further south on the Kapiti Coast.

Beckett (Beckett, 1957: 357) also observed the characteristics of the middens, and concluded that they were not the result of occupation as permanent dwelling places, but rather, as fishing and food gathering camps. The reason for this conclusion was the lack of variety in the contents of the middens, each being composed almost entirely of open shells without the usual mixture of what may be termed household refuse.

Carkeek's history of Māori occupation also includes a chapter on the middens of the Kapiti Coast (Carkeek, 1966: 102-107). He summarised observations of previous writers, but also made observations as to the nature and characteristics of middens. He noted that shellfish was often dried on strips of thin flax to store for later use. Carkeek also differentiated between sites as temporary camps or permanent occupation, on the basis of the size and constituent elements.

4.1.1. Characteristics of middens

All middens recorded during the M2PP archaeological programme were located on sand dunes. The middens were located on various places on the dunes: on the crests of the dunes; on the slopes just off the crests, where the people were presumably sheltering from wind; and, less commonly, on the lower part of the dune slopes, suggestive of people sitting on the upper dune slopes processing food and tossing the shells downslope. The middens were located on all sides of the dunes, not just the sides facing the sun, suggesting people were using the dunes to shelter from the wind coming from various directions.

Most middens were located directly beneath the overlying topsoil, directly on the underlying sand. This suggests the sites postdate the deposition of that dune. The middens themselves have occasionally started breaking down organically as they are often contained within a dark organic soil immediately around the shell. This dark soil is not oven material, as it does not leave a charcoal stain; instead, it appears to be the organic decompositional material of the shells. The predominant species in the M2PP middens was tuatua. The middens were usually comprised of dense deposits of whole shell.

With very few exceptions, the middens recorded all appeared to be single episode events; that is, each midden was deposited during one occupation event. This is inferred from the fact that no truly stratified middens were observed; all sites were comprised of various species or material types intermixed. Where possibly stratified sites were observed the evidence for stratification is not overwhelming: rather than thick distinct layers of sand or soil between shell deposits there are

occasionally very thin bands of sand such as could be deposited during a short period of intense wind. At site R26/373 the SPAR team noted:

> "The midden was stratified in places, although it was not possible to determine on site whether the layers represented significant time depth or simply re-use of the site over a short period, with wind-blown sand creating an impression of time depth" (Brooks, 2016: 90).

However, having stated that each midden was deposited during one occupation event it should be noted that an occupation event, such as a large group of people on a fishing or food gathering trip, could have lasted several weeks. Rather than stratification, many of the larger middens within the parabolic dunes north of the Waikanae River showed evidence of targeted species deposition. This was evidenced by dense pockets of a particular shell type within a midden, suggesting perhaps people obtained that particular species over a few days within a longer food gathering trip. An event such as a storm may have provided a sudden availability of a particular species, which the people took advantage of.

The majority of middens have high percentages of whole or mostly whole shell with little visible evidence of burning or heat alteration. This suggests shellfish were steamed open to facilitate removal of flesh. Many middens were located near "fire features" some of which do not appear to be ovens, and which are interpreted as fires for smoking food. Fire features are discussed in more detail below.

4.1.2. Size analysis

Analysis of the size of the middens gives insight into what people were doing and where they were doing it. The size of the midden site indicates activity in the broadest sense: the difference between a small handful of shells that may have constituted one quick meal for a small group of people on the move, compared to a large factory floor comprised of detritus from the collective organised activities of a large organised group of people.

The surface area of the midden sites was measured and analysed: it is stressed that this is the surface area of each site as opposed to volume, as in many cases insufficient data was gathered to be able to quantify volume. The smallest site recorded was 0.01m^2; the largest was 300m^2. The average site size was 13.7m^2. However, the median size was 1m^2. Supplementary data 1 lists the size data for all M2PP middens where size had been recorded. Figure 20 shows the size distribution of the middens.

It is apparent in Figure 20 that while the range of sizes of middens is large, the majority of sites are in fact quite small – most middens (79%) were 10m^2 or smaller. As noted, the median size was 1m^2.

A histogram chart shows the frequency of area, seen in Figure 21.

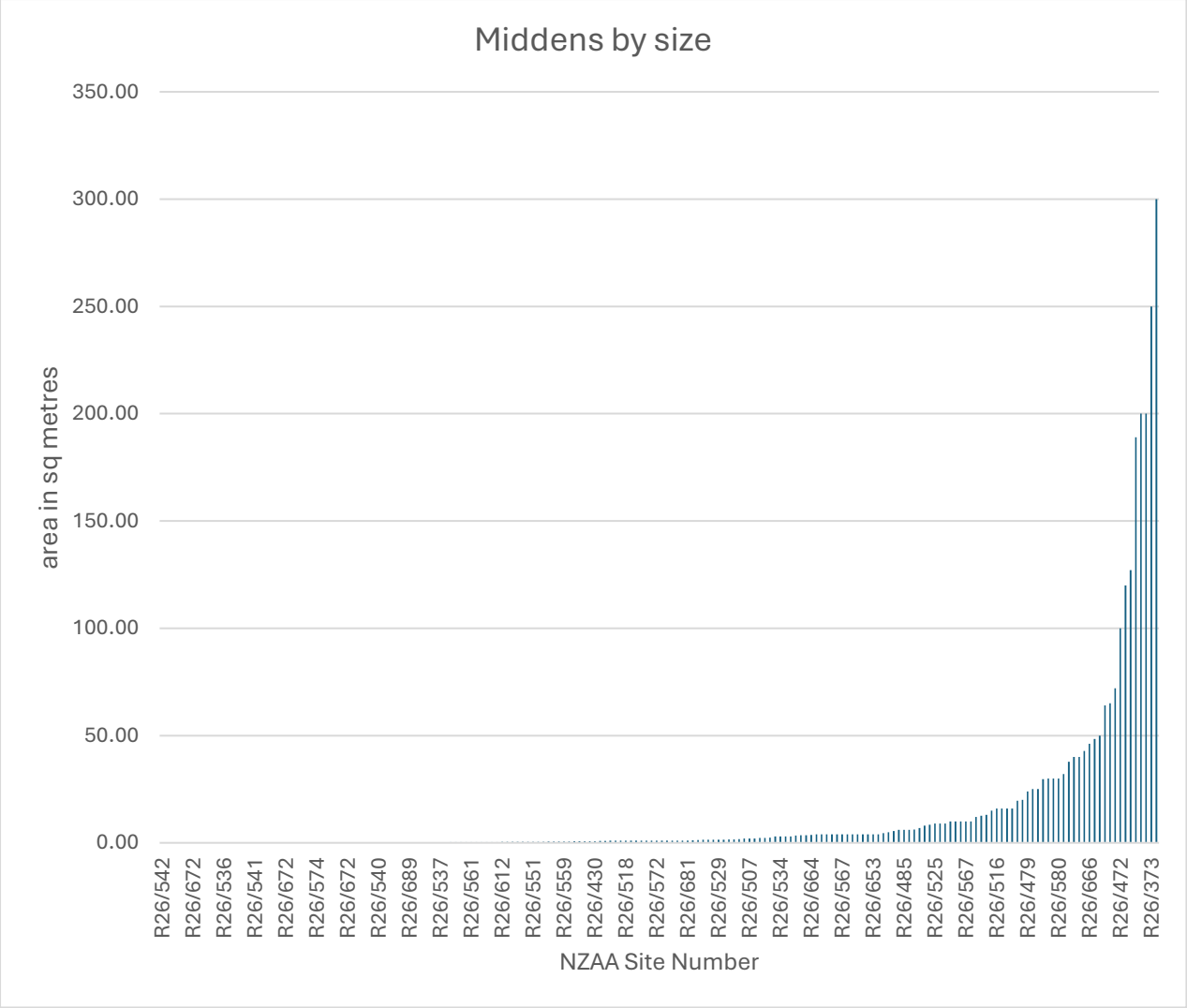

Figure 20: Size distribution of M2PP middens

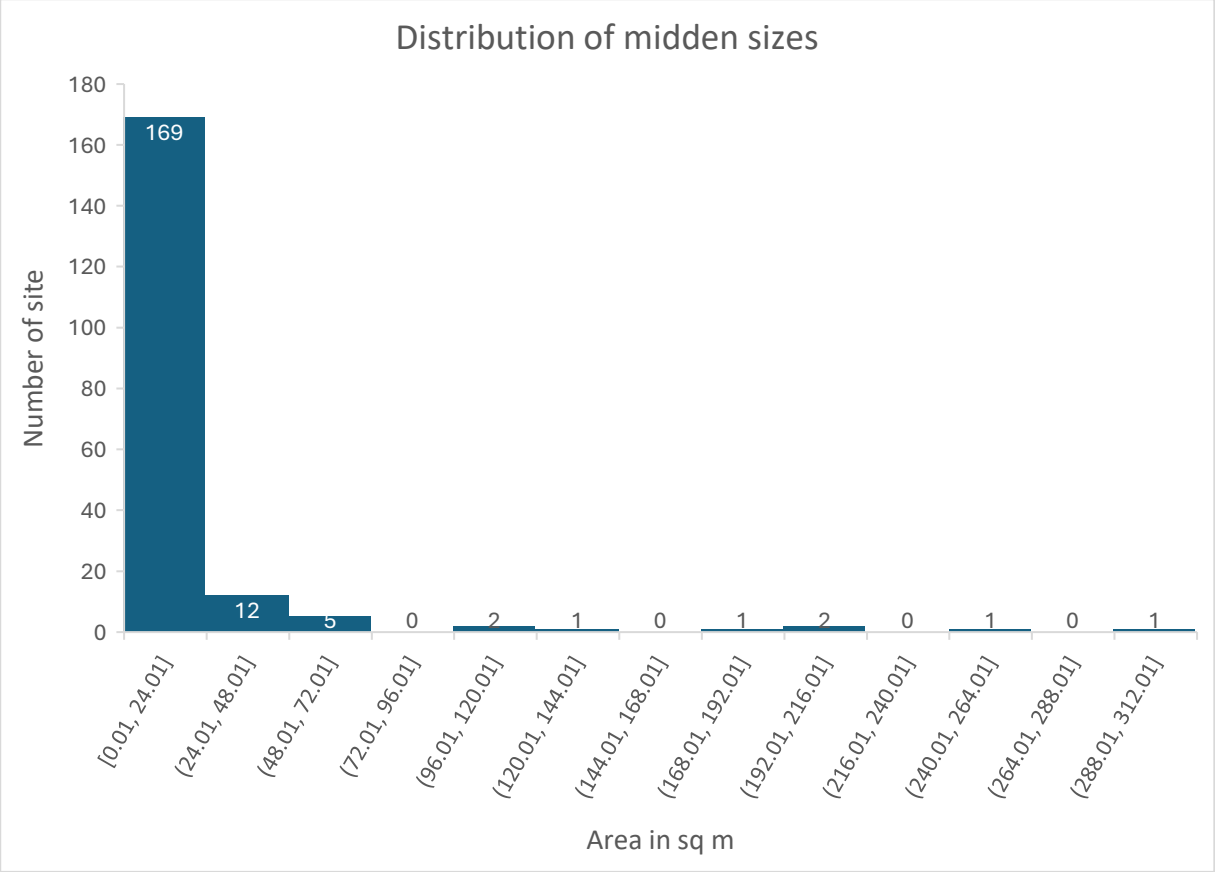

Figure 21: Distribution of midden sizes

Figure 21 shows that the areas of middens fall into five groups:

- Sites 0m² to 24m²
- Sites 24m² to 72m²
- Sites 96m² to 144m²
- Sites 168m² to 216m²
- Sites 240m² to 300m²

To aid analysis and to try to give meaning to the data the five groups were re-clustered by the author into three general groups:

- "small" sites, up to 24m²
- "moderate" sites, 24m² to 72m²
- "large" sites, 96m² to 300m²

These site sizes all represent quite different human activities:

- The smallest middens probably present individuals or perhaps very small groups moving through the area and pausing for a very quick meal

- The moderate sized middens probably represent groups of people moving through the area to fish or gather resources, and probably camping for a short period of time
- The larger middens probably represent quite different and specific activity. These sites represent a socially cohesive and co-ordinated group of people moving into the area for an extended period of time for planned shellfish gathering expeditions. They are processing large quantities of shellfish collected in organised excursions, and are processing the gathered food on site to transport elsewhere. These sites could be regarded as factory floors.

These three size clusters tell a story when plotted onto the landscape, as seen in figure 22.

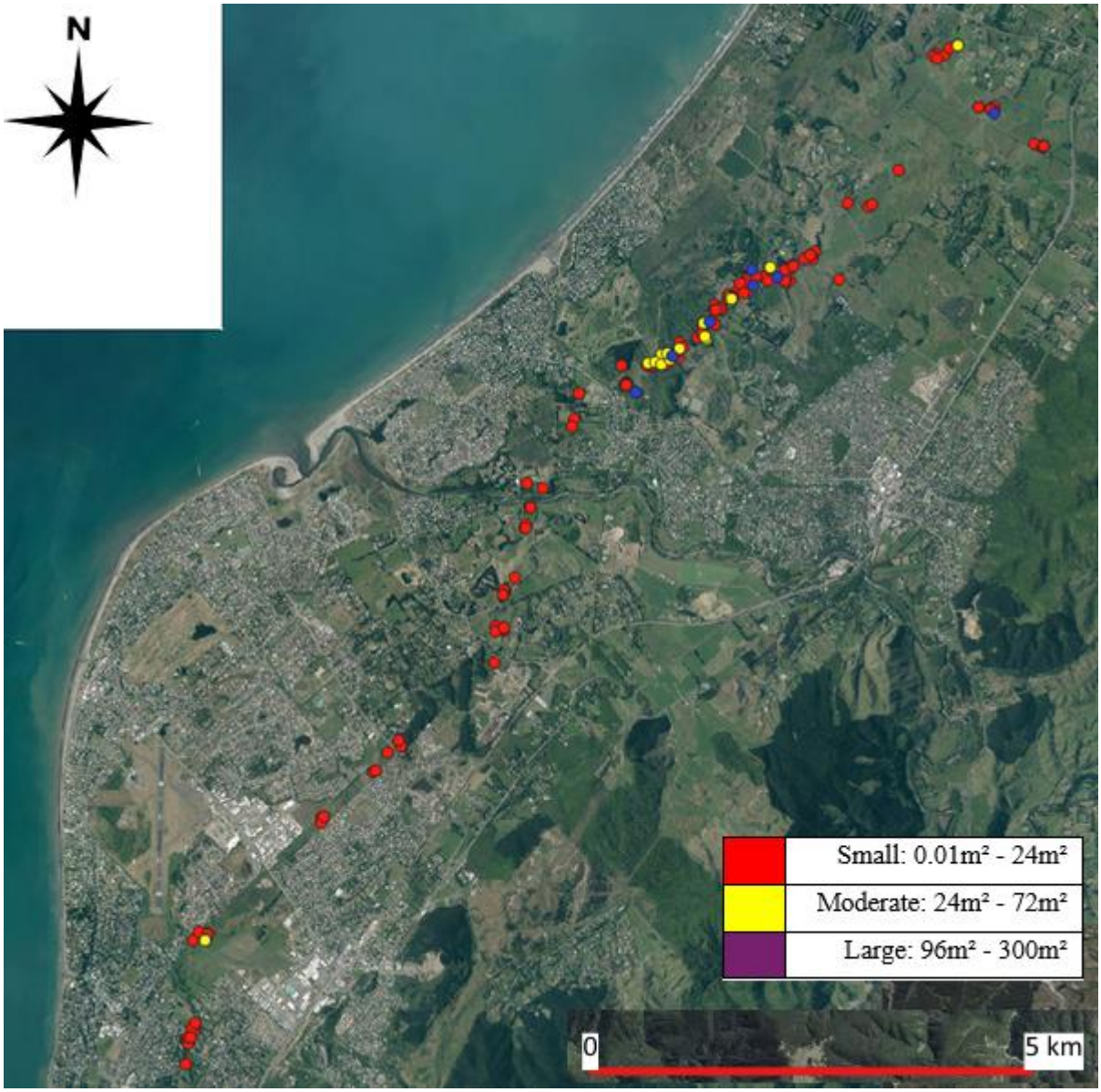

Figure 22: Middens by size groups

It can be seen that the majority of midden sites south of the Waikanae River are small, and all of the large sites are only located north of the river. There are only small (less than 24m^2) middens south of the Waikanae River except for two sites. These two moderate sized middens are both located within close proximity to each other and both on the north bank of the Wharemauku Stream, which would of course have been navigable from the beach.

The majority of the moderate sized midden sites and all of the large midden sites are located north of the Waikanae River. The size pattern is significant within the high parabolic dunes north of the Waikanae River: whilst middens of all sizes occur here, the largest sites occur only here. This demonstrates a particular preference for this specific environment. It is notable that no postholes or evidence of structures was recorded near any of the midden sites (or indeed anywhere in the M2PP construction corridor). This lack of structural evidence supports a hypothesis of food gathering camps, as opposed to permanent kainga or settlements.

4.2. Ovens and fire features

"Fire feature" was a site type recorded during field work, and these sites were recategorized in the data analysis phase, based on apparent function.

Two types of sites were categorised:

- Ovens, including oven rakeout. These were sites clearly used for cooking or food preservation. They were usually characterised by very dark greasy sand and occasionally the presence of shell or bone. There was usually some fire-cracked rock within or very close to the greasy sand. Occasionally the oven had been raked out, that is, the oven material including the shell had been pulled out of the oven and deposited around it.
- Fire features. These were features where a fire had been constructed, but the purpose was not clear (although lack of greasy sand or shell suggests the function was not cooking). These features might have been small ovens, or they could have been hearths for heat sources within a temporary camp, or they may have been used to smoke shellfish meat for preservation. They usually contained fire-cracked rock.

A conservative categorisation approach was taken – a feature was only called an oven where this function was clearly and unequivocally the case. The more ambiguous features were called fire features, but it is possible some of them are in fact small ovens.

The identification and categorisation of such sites was complicated by the prevalence of many dark apparently burnt areas of sand on the dune surface beneath the topsoil. These features were interpreted as vegetation burning, where the roots of the plant had burnt into the substrate (intact burnt root material was occasionally present). The Project Archaeologist tested several of these features by hand excavation early in the fieldwork programme to establish their nature and origin, in order to be able to distinguish cultural burnt features.

Cultural fire features were distinguished from these natural burnt features by:

- Presence of fire-cracked rock within or very near the burnt feature
- Presence of shell or greasy sand within the feature
- Close proximity to archaeological features
- Absence of burnt root material

There were relatively few ovens or fire features recorded as part of the M2PP archaeological programme. Seventeen fire features and 37 ovens or areas of oven rakeout (16% of site total) were recorded. Ovens were beside or in close proximity to middens, and were located in isolation.

Only two intact ovens were observed, R26/478 and R26/568. Both were in the high parabolic dunes north of the Waikanae River. Each was intact in that the oven stones were *in situ* in the base of the oven feature, and overlain with charcoal-stained greasy sand.

Figure 23: R26/478 intact oven, after half-sectioning. Brooks (2016: 58)

Ovens were often, but not always, in close association with middens: R26/567 was an apparent camp site, located on the edge of a former large wetland within the curve of a high dune, comprised of a number of ovens bordering a very large area of midden. An obsidian cutting tool was found beside one oven.

The archaeological evidence suggests ovenstones may be a precious commodity - very few *in situ* ovens were recorded; most ovens were represented by greasy sand with fire-cracked rock. This suggests

that intact unfractured stones may have been exhumed from the oven after use and carried away for reuse. Contemporary cultural evidence notes that stones from the Waikanae River are of poor quality in a hangi and fracture easily under heat, whereas stones from the Otaki River are prized for being more robust (Les Mullen, iwi monitor, conversation with the author, 2017). Best recorded various uses of ovens in preparing food:

> "The Māori employed several different modes of cooking shell-fish. They were often cooked in the ordinary form of *umu*, or steam-oven; but a better method consisted of heating the stones in a fire aside from the *umu* pit, and then, when thoroughly heated, they were placed in the pit and covered. A third method, termed *tuwhatu*, was carried out by piling the shell-fish in a heap and enclosing it within a circle of fire, or dry fern or brush was placed on them and burned; presumably this would not cook the shell-fish, but it would cause the shells to open and so render the fish readily accessible. In the *kohue* method a number of shellfish were placed in a gourd vessel, and among them hot stones were placed. This caused the shells to open, and from them escaped a quantity of saline liquid that was esteemed as a desirable beverage for invalids" (Best, 1977: 77).

> "Shell-fish were strung on lines and dried in great quantities, in which state they would keep for a long time. The Rev. W. Yate tells us that shellfish were first cooked in the steam-oven, then threaded on strings, and hung out to dry and harden after which they were put away in the storehouses. These would be again steamed prior to being eaten" (Best, 1977: 82).

The archaeological and environmental evidence from the Kapiti Coast supports these described methods: ovens with ovenstones were present, as was flax in the inland wetlands.

4.3. Burials

Traditional burials within the sand dunes are a reasonably common site type on the Kapiti Coast, as attested by several entries in ArchSite. An example is a cluster of burials found on a sand dune during development work for a subdivision on the northern edge of Paraparaumu in 2005, and investigated by the author of this report. Six burials in close geographic proximity were revealed and investigated; both adults and children were present and artefactual evidence suggests their deaths occurred in the first decades of the 19th century (O'Keeffe, 2005). Data from ArchSite shows individual burials are revealed moderately frequently within the intact dunes of Queen Elizabeth Park. Because of the likelihood of locating kōiwi tangata, a kōiwi tangata protocol was developed in associated with the iwi, which set out clear procedures and expectations. In fact, only one kōiwi tangata was located during the M2PP

archaeological programme; based on occurrence of burials in the dunes the lack of kōiwi tangata encountered in the M2PP earthworks programme was a surprising and unexpected outcome.

A burial was exposed during the removal of a dune ridge immediately south of the Waikanae River. The bones recovered represent a single female individual of Māori origin. The majority of her long bones, pelvis and a number of ribs and foot bones were visible on the surface after being disturbed by the excavator. The remainder of her skeleton was present but buried, and was recovered by controlled excavation. Her bones were generally in an excellent state of preservation, and a number of observations could be made on the basis of photographs and field inspection. Her pelvis was characteristically female, and elements of her mandible and cranium were characteristically Māori. Her teeth were heavily worn exposing the pulp cavity, which is characteristic of later prehistory and reflects a rougher diet (Dodd, 2014). She was reinterred by iwi in an adjacent urupa.

4.4. Gardening sites

A notable and unexpected outcome of the M2PP archaeological programme was the lack of any sites or evidence associated with pre-European gardening. Prior to the commencement of the M2PP programme the Project Archaeologist had reviewed the archaeological data for gardening on the Kapiti Coast; an apparent lack of gardening sites was a notable aspect. In her scoping report for the M2PP project, the Project Archaeologist noted "Little evidence of gardening has been recovered on the Kapiti Coast; the archaeological evidence of gardening is thus not clear" (O'Keeffe, 2011: 51). The evidence prior to M2PP was limited to storage pits on the ridge above Paekakariki, and ambiguous possible pits in Queen Elizabeth Park.

It is important to note that gardening clearly took place in the historic period, as there is much documentary and traditional evidence for it. It is probable that areas of gardening recorded on survey plans by the surveyors as "gardening", "native gardens", or "cultivation", may represent areas where Māori grew European introduced crops such as wheat and white potatoes, which were more tolerant of the dry sandy soils of the coastal dunes.

Identification of archaeological evidence of gardening was noted as an important research theme for the M2PP archaeological programme. Such evidence could be primary: modified soils, mixed soil horizons or storage pits; or secondary, such as artefacts associated with gardening. No unequivocal evidence of gardening was found during the M2PP archaeological programme. The Project Archaeologist made it a priority to test for such evidence, looking in both likely locations such as river peripheries which would receive periodic deposits of rich alluvial soils, and also in unlikely locations, to ensure no expectation bias.

Machine trenching was undertaken in numerous locations along the expressway route under the Project Archaeologist's direction, specifically for the purpose of testing for the presence of either mixed soil horizons or addition of material to facilitate gardening (gravel or organic material). No mixed horizons or added material were observed. The few features recorded as possible pits during the preliminary field survey were all investigated, and none of them were determined to be manmade in origin.

A piece of archaeological work completed adjacent to the M2PP alignment adds to this discussion. Jones monitored development work for a lifestyle subdivision called Waimeha Village, located north of the Waimeha River and on the western boundary of the M2PP alignment (Jones, 2018). Several features had been recorded as pits, on the basis of their surface evidence (five pits on top of a dune). Jones investigated the pits and could not reach a conclusion on their origin. Machine scraping revealed none of the pits had a level base or were regular in form. Jones ruled out the pits being of natural origin. Jones considered several cultural functions for the pits – kumara storage pits, white potato clamps, defensive structures associated with the Kuititanga Battle of 1839, WW2 defensive structures, or pits for storing fence posts. Jones considered they were unlikely to be kumara storage pits, based on their form, but concluded their function was unclear (Jones, 2018).

The author postulates that pre-European gardening did not take place along the Kapiti dunes, based on the lack of archaeological evidence for gardening. The reasons for lack of gardening are not clear, but may be related to the physical environment. The Project Archaeologist noted during construction earthworks that the dunes immediately became unstable once their vegetation cover was removed. This was presumably also the case in the pre-European period. The reasons for lack of gardening may be simply that considerable effort would have been required to create and maintain a garden on the coastal dunes, and that return for effort was not justified given the rich availability of marine-based resources.

It is, however, possible that gardening of pre-European crops may have taken place inland from the coastal dunes. A possible location is the area of what is now the eastern part of Waikanae township, east of the railway line. This landscape is elevated, gently sloping, north facing, and removed from the worst of the onshore coastal winds. It would also receive slope-washed deposits of alluvial soils from the inland hills immediately adjacent to the east. Historic survey photos from the 1940s and 1950s (prior to the intense urbanisation of this area) were viewed by the Project Archaeologist to see if any evidence of gardening such as pits could be seen; none was evident. It would be difficult to test this hypothesis as the area is now intensely urbanised and evidence of pre-European gardening is likely to have been subsumed by subsequent domestic and urban modification.

4.5. Earthworks sites and structures

Along with lack of gardening, a second notable aspect of the archaeology of the dunes of the Kapiti Coast is the lack of earthworks sites or structures: that is, sites constructed into the underlying landform, including pits, terraces, and pa, or structures such as whare.

This appears to be because of the geomorphology of the region – the coastal dunes are constructed of sand, and evidence for conflation and deflation of dunes suggests they are unstable. During archaeological monitoring observations were made of buried topsoil horizons within dunes, or dune horizons where a dune had been inundated by a subsequent deposition event, characterised by sand of a different colour and grain size.

Figure 24: Examples of buried topsoils or dune horizons. A: shallow buried topsoil between dune deposition episodes, revealed by machine cutting. B: shallow buried topsoil between dune deposition episodes, revealed by machine cutting. C: buried topsoil between dune deposition episodes, showing difference in sand colour and consolidation.

The author postulates that there are no earthworks sites on the coastal dunes for the same reason there appears to be no pre-European gardening, which is the dunes' instability – quite simply, after removal of vegetation, earthworks sites would quickly be eroded by wind. As noted, the Project Archaeologist observed during earthworks monitoring how quickly the dunes deflated once the overlying vegetation had been removed.

The strong visual differentiation in colour between the sand and archaeological features made recognition of features during earthworks relatively easy. Postholes, if present, are likely to have shown up because of this visual contrast. No post holes were observed during earthworks monitoring, suggesting no permanent structures such as whare or storehouses were present on the coastal dunes.

4.6. Artefacts

Some historical observations on material culture on the Kapiti Coast have been recorded. Best noted that "the late Mr Hamilton had collected nearly one hundred stone adzes and parts of such implements" in an unspecified location somewhere on the coast (Best 1918, 216). Best also noted that when a pond "near the hotel" was drained, some wooden spears were found (Best does not state which hotel, but in the early 1900s the main hotel on the coast was the Ferry Inn on the south bank of the Waikanae River at Arapawaiti). Such spears could be evidence for bird hunting.

Several artefacts were recovered during both the SPAR team's high-level investigations, and through the earthworks monitoring programme. All these objects have a story to tell. The artefacts are detailed in Supplementary data 3.

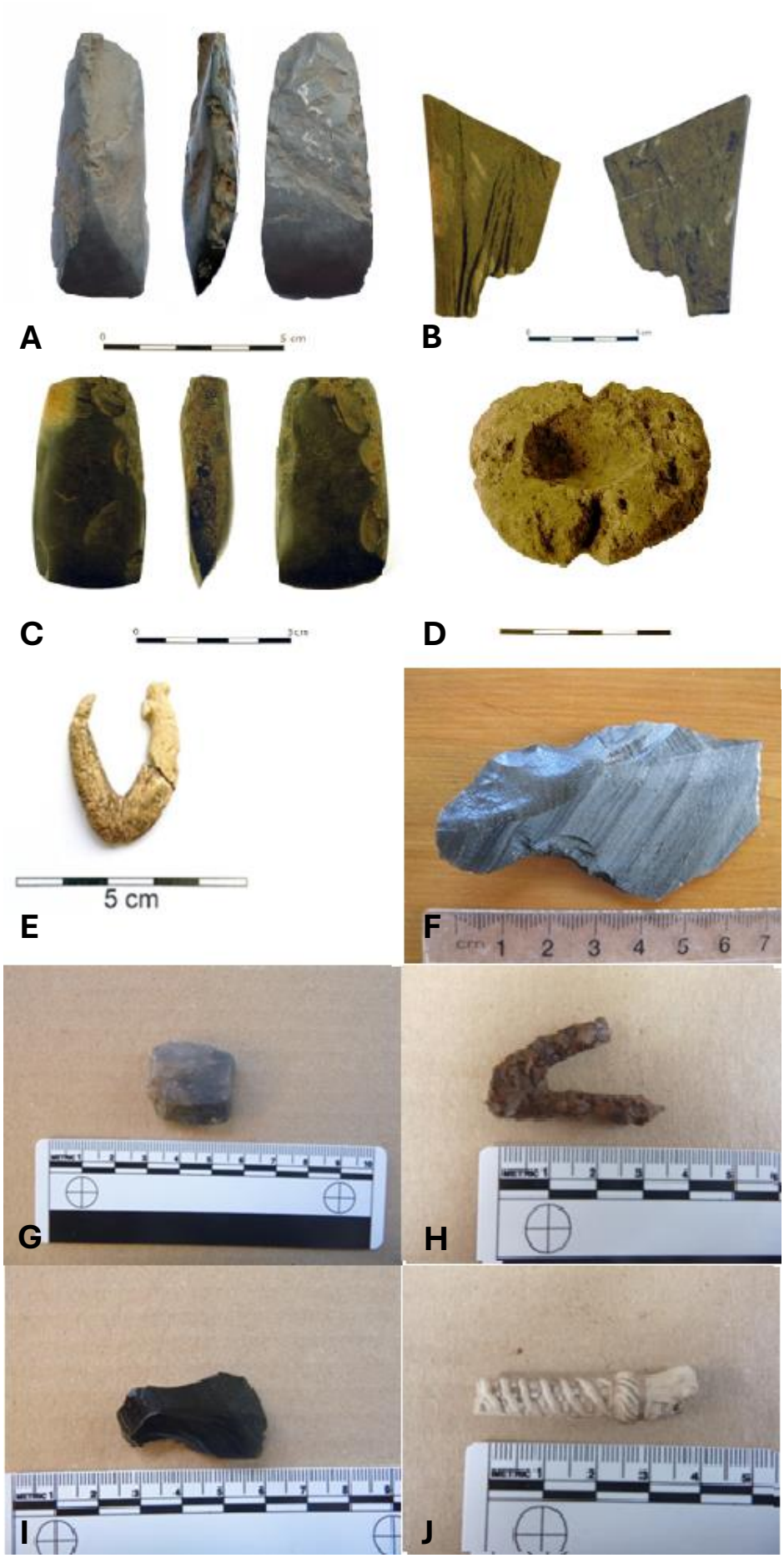

Figure 25: Selection of M2PP artefacts. A: Small adze from near R26/433. B: Grindstone or hoanga found at R26/472. C: Adze head found at R26/482. D: Pumice bowl or container found at R26/430. E: One-piece bone fish hook from R26/373. F: Obsidian flake from R26/56. G: Musket flint from R26/591. H: Metal nail fishhook from R26/487. I: Obsidian flake from R26/597 (obverse). J: Pipe stem from R26/487.

The material culture was of both Māori and European origin. The predominance was of pre-European artefacts, with functions associated with domestic use – obtaining food, processing resources, and day to day life.

Several of the artefacts have the potential to tell a significant story. One such piece is a tool made of obsidian obtained from a site interpreted as a food gathering camp (R26/597). The obsidian piece had its edges shaped so as to comfortably fit between the user's fingers and thumb, and was possibly used for cutting while processing food. Another interesting find was a musket flint found at R26/591, on the high dunes north of the Waikanae River. This is near the area where the Kuititanga Battle of 1839 took place; this battle was fought with muskets and was referred to as the "running battle" as the adversaries ran along the dunes and the beach. It is quite possible this flint was dropped during this important historical event.

The artefacts of European origin (bottle glass, smoking pipes, metal nails) are also of significance and can tell an interesting story. Since many of these objects were found in association with shell middens, they represent transitional subsistence; that is, when Māori were still utilising traditional resources and food, but also transitioning new resources into their lifestyle. The bent nail, presumably used as a fishhook, is a tangible example of mixing old and new technologies.

4.7. Faunal Analysis

Detailed faunal analysis was undertaken for the sampled derived from the M2PP archaeological programme. The SPAR team processed their samples at Otago University, and the material sampled during the earthworks monitoring programme was processed and analysed by Yolanda Vogel at Kapiti. Every midden-bearing site investigated during the high-level investigations was sampled, and all samples were analysed.

Most sites investigated during the monitoring phase were sampled, but only a subset (54 sites) of the samples taken were analysed. The monitoring-derived sites selected for analysis were chosen either because of a particular aspect of the sample elements (for example, notable constituent species) or to ensure a representative geographic spread across the project in association with the locations of the SPAR team samples. Several faunal species were present: shellfish, fish, bird, mammal and reptile.

Analysis of the M2PP midden assemblages indicates a subsistence economy largely focused on the collection of sandy shore shellfish, with minor contributions from other habitats. Taken in conjunction with other evidence from these sites, it is likely that shellfish harvesting was undertaken for the express purpose of processing and preserving shellfish meat for later consumption off-site.

The evidence suggests fishing and fowling formed only a minor component of the subsistence economy, as a supplement to the diet during occupation of the sites. Taphonomic processes affecting preservation of bone have undoubtedly created a bias in the vertebrate assemblages, and some of the fish and bird catches may also have been preserved for later consumption. It is therefore possible that fishing and fowling formed a larger component of the economy that that suggested by the archaeological record. Of the vertebrate species present, fish was the most dominant. Other species present include bird, rat (*Rattus exulans*), dog (*Canis familiaris*) and tuatara (*Sphenodon punctatus*).

A total of 24 fish taxa, including cartilaginous sharks and rays, were identified. Wrasses (*Labridae*) comprised nearly 15% of the total identifiable species. The species identified come from a range of habitats, including open water, rocky shore and freshwater, and would have required a range of fishing techniques to capture. Interpreting zone of capture and fishing technique is not always straightforward, as some fish will range over a number of habitats, and most can be caught via more than one technique. Small-scale freshwater fishing is indicated by the presence of freshwater eels (*Anguilla* sp.) and kokopu (*Galaxis* sp.).

Over 800 bird bones were recovered, with birds represented in 34 of the 78 sites included in the analyses, the majority being north of the Waikanae River. As with the fish remains, most of the bird bone was too fragmented to identify. Analysis resulted in the identification of at least 14 species. The assemblage was dominated by forest and wetland birds, including grey duck, parakeet, weka, kereru, kaka, stitchbird, North Island saddleback, tui, and NZ fantail

Three species of mammal were identified from the samples analysed; Polynesian rat (kiore), dog, and sheep, along with some mammal bone that was too fragmented to identify to species. It is notable how little dog bone was found in any of the Kapiti sites. This appears to conform to a more broadly observed pattern of more dogs in the early period sites than in later sites.

Two tuatara jaw bones were found in one of the sites. This appears to be the first time tuatara has been identified from an archaeological context on the Kapiti Coast. Although tuatara are known from other midden sites around New Zealand, and were presumably eaten (Davidson, cited in Vogel, 2018), there are other potential explanations for its presence.

4.8. Palaeoenvironment

The SPAR team submitted charcoal samples from 20 sites for paleoenvironmental analysis, undertaken by Dr Rod Wallace of Auckland University. The results show that about two-thirds of the sample was made up of several forest tree species, which were mainly broadleaf (including kahikatea and matai). Twenty per cent of the samples comprised shrub and scrub species, and the remaining twelve percent of the sample was bracken-derived charcoal.

In their discussion of the charcoal analysis and its paleoenvironmental implications the SPAR team stated the importance of understanding "that a charcoal assemblage from an archaeological site largely represents dry deadwood collected by people for firewood. It does not necessarily reflect the living treescape at the time of human occupation" (Brooks, 2016: 121). The SPAR team noted how species with large trunks such as matai can survive as deadwood for long periods after the tree's death, and the wood then collected and burnt does not necessarily represent spies present in the environment at the time of the cultural burning event.

As the SPAR team's samples were from the limited geographic scope of their investigations (the area north of the Waikanae River, between Te Moana Road and just north of Ngarara Road) further palaeoenvironmental testing was undertaken by the Project Archaeologist. Landsnails were floated from midden samples collected during the earthworks monitoring phase: this provided both a spread of the geographic range of testing plus a different test basis.

Landsnails from 27 sites across the expressway corridor were identified by Dr Frank Climo, of Wellington. Dr Climo noted that there were not enough snails present in each individual sample to identify specific vegetation at each individual site, but that the species present (including some Dr Climo had not seen before in the wider Wellington region) indicated broadleaf forest cover.

The palaeoenvironmental data supports a landscape comprised primarily of broadleaf and conifer forest species. The shrubs and bracken fern charcoal species may represent periodic cultural burning.

The SPAR team concurred with Dr Wallace's suggested hypothesis of a landscape covered in matai-dominant broadleaf forest with the sites located in clearings that hosted bracken and shrubs soon after clearance. This hypothesis is supported by the author's observations of the instability of the dunes once vegetation was removed during earthworks. The author is of the opinion that wide-spread cultural burning is unlikely to have been undertaken as the first occupants of the coastal dunes would have observed this resultant dune instability. This hypothesis requires further testing.

4.9. Chronology

As the SPAR team noted:

> "The material evidence recovered during the [high level and monitoring] investigations provided very little indication of the likely time of occupation of the sites. The absence of taxa that disappeared early in the prehistoric sequence or Archaic artefact types suggests that the sites were generally late, or Classic." (Brooks, 2016: 114).

Information on chronology and occupation periods of M2PP sites was therefore strongly underpinned by radiocarbon dating.

A total of 52 samples from 39 sites were submitted for radiocarbon dating. Thirty-three samples from 23 sites were submitted from the SPAR team's work, and a further 20 samples from 16 sites were submitted by the author from sites sampled during monitoring of construction earthworks. As all the SPAR team samples had been obtained from sites between Te Moana Road and just north of Ngarara Road, the samples dated from the monitoring phase were from sites outside that area, so as to obtain a good geographic spread of sites across the construction corridor.

Figure 26: Location of sites tested for C14

The SPAR team submitted a mixture of charcoal and tuatua shell for dating site from the high-level phase of investigations; all samples from sites from the monitoring phase were tuatua. Supplementary data 2 lists the radiocarbon dates yielded for the tested sites.

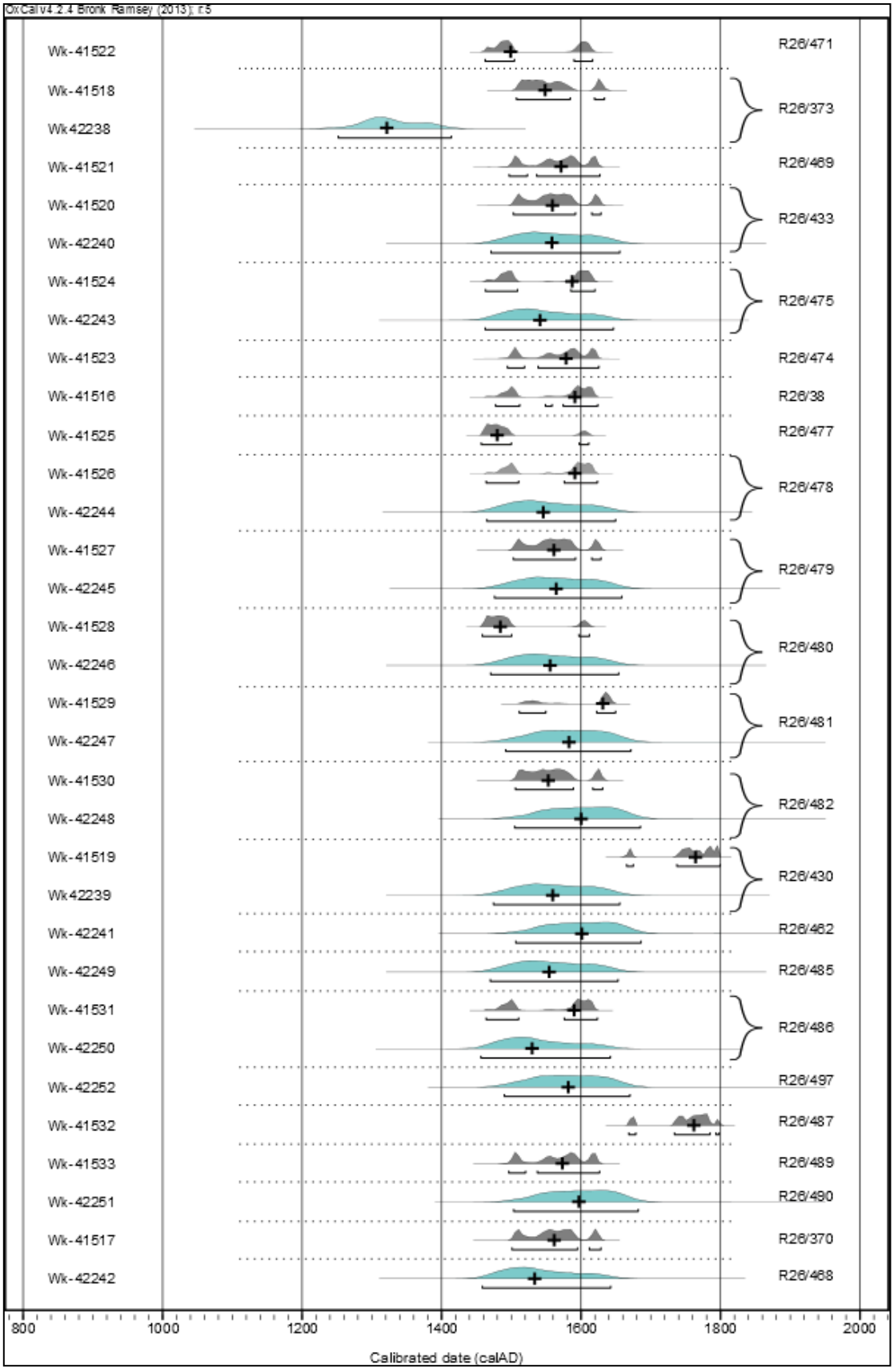

Figure 27: SPAR samples C14 results Calibrated radiocarbon dates for M2PP sites (north to south). The grey shaded dates are charcoal of identified short-lived species or seeds; the blue shaded ones are marine shell (tuatua) calibrated using a delta R value of -7 ± 45. The crosses mark the median age of each date.

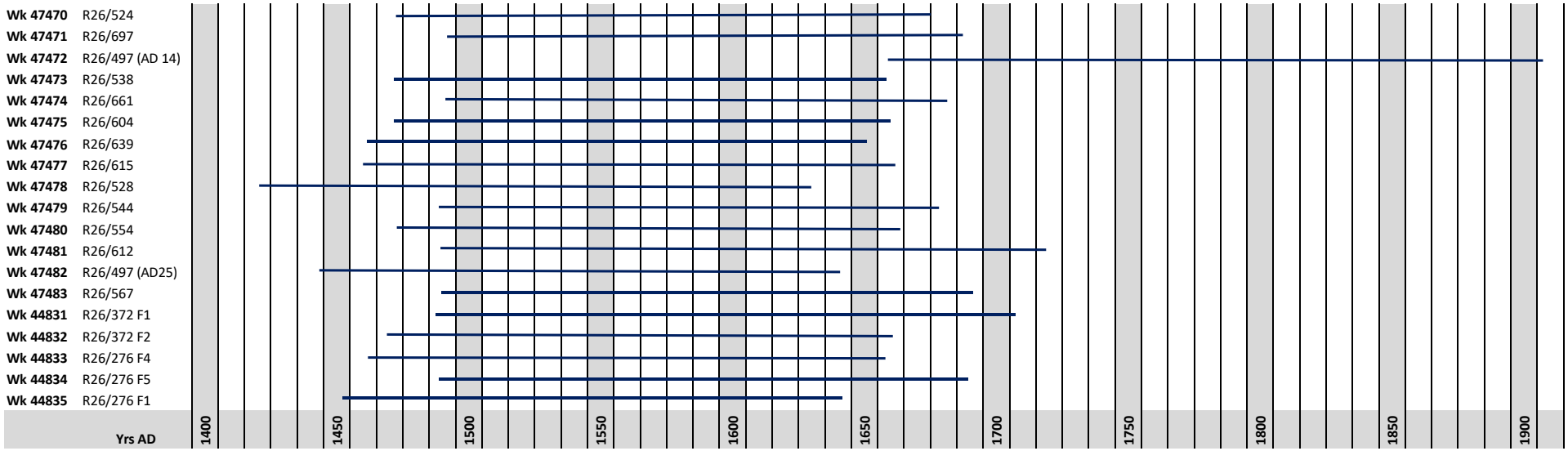

Figure 28: Monitoring phase C14 dates Calibrated radiocarbon dates, expressed to two standard deviations

The radiocarbon dates for the M2PP archaeology programme are notable for their consistency: with very few exceptions they all cluster around the 16th century. These dates, together with the nature of the faunal and artefactual material, all present a picture of occupation on the Kapiti Coast dunes from the early to mid-16th century onwards. In terms of New Zealand's prehistory, this time period falls within the Classic period, as opposed to the earlier Archaic Period.

An important factor when considering the age range of the sites dated as part of the M2PP project is the specific geographical context of the sampled sites. They were all from the linear expressway corridor, and were all in a similar zone of distance from the coast. It may well be therefore that the dates derived are in fact a product of sampling limitation. Older sites may be located further inland. However, it is noted that there are no early dates for any of the sites recorded in all archaeological work undertaken on the Kapiti Coast.

There are four notable outliers: R26/430, R26/487, R26/497 and R26/373. These first three have dates that extend into the historic period (1800AD onward). As some investigated sites contained post contact artefacts or faunal material (clay pipes, sheep bones), this extension of dates into the historic contact period is not surprising. The most notable outlier is R26/373. This site was a very large midden site, located some 1.5km inland, within the bands of high parabolic dunes north of Te Moana Road. The site has a median date of about 1300AD, in marked contrast to all other C14 dates obtained for M2PP sites (Brooks, 2016: 119).

The SPAR team postulated this site represents small-scale early occupation: while this cannot be discounted nor disproved on the basis of current data, the absence of correlating evidence makes it unlikely. There are no other radiocarbon dates, artefacts or faunal material that supports any degree of occupation or resource exploitation prior to about the 15th century. Whilst it is quite possible that early Māori may have passed along the coast in waka prior to the 15th century, the author considers it unlikely that a group of people would have landed on the coast and chosen to travel well inland (nearly 2km) to just one otherwise unremarkable location, not left any other archaeological evidence anywhere else on the coastal dunes, and not returned for 300-odd years.

The apparent lack of archaic sites on the Kapiti Coast dunes remains a major research theme for the region's prehistory. There are no known archaic sites within the extent of the coastal dunes; that is, from Queen Elizabeth Park in the south to Peka Peka in the north. Two reasonably well documented archaic sites have been investigated in the wider area, at Paekakariki (R26/247) to the south of M2PP and Foxton (S24/3) to the north. Both sites contain artefact types and faunal material such as moa that place them in the early phase of human settlement and exploration of New Zealand. In contract these artefact types and faunal material are absent from sites on the Kapiti Coast, both within and external to the M2PP site assemblage.

While these two archaic sites have some proximal relationship to the Kapiti area, they contrast with the Kapiti dunes in that they each occupy quite different environmental niches. The Paekakariki site is right on the coastal edge, in a narrow strip of land only about 100m wide from the coast to the edge of the steep wave-cut cliff. The site is beside an area of rocky shore which would have provided marine resources, and forest resources from the forest edge on stable soils at the base of the wave-cut scarp. The Foxton site is

within a wide band of dunes far more geomorphologically stable that the dynamic Kapiti dunes, and in an area where the stable dunes allowed the formation of a stable topsoil which in turn facilitated gardening.

One artefact was recorded during the M2PP archaeological programme which is of an apparent archaic style. This is an argillite adze found by the SPAR team near site R26/433. It is triangular in cross-section with its apex to the front, consistent with Duff's type 4 adze, and typical of archaic phase adze styles (Brooks, 2016: 104). However, this is the only known archaic-period artefact, and it is quite feasible that it is an older artefact that continued to be used for some period of time.

There is an absence of typically archaic faunal material such as moa or seal from sites on the Kapiti dunes. No recently recorded or investigated sites have contained moa bone. In short, there is not enough robust, verifiable, archaeologically-obtained evidence for moa to confirm that moa were present and being hunted on the coastal dunes. The bones reported from sites could have been brought in from elsewhere. Overall, the presence and absence of data argues for exploitation of resources on the Kapiti dunes from the early to mid-16th century.

5. Discussion

The archaeological site distribution data gained from the M2PP archaeological programme has a significant characteristic – it can be regarded as a comprehensive and representative data set. Because earthworks for the entire expressway route were monitored, virtually every site present within the expressway corridor was found and recorded, as opposed to sites being sought just in the environments or locales in which they were expected, removing recording bias. The pattern of site distribution is therefore a reliable and robust one – absence of sites is a true absence of archaeological material as opposed to an absence of observation.

Consequently, high level observations of the culture history, subsistence economy and archaeology of the Kapiti Coast dunes can be yielded from the data. The models and hypotheses gained can of course only be applied with surety to the expressway route, but the robust nature of the data suggests that these models and hypotheses can be extrapolated for the rest of the coastal area where the environment and landforms are similar.

The overarching model is one of people moving periodically to the area for the express purpose of temporary exploitation of the rich marine resources present. The author postulates the people utilised a water-based transport route through the dunes, from the coast to the inland wetlands, to process the marine food gathered on the coast.

This contrast in site density and site nature between land north and south of the river is striking. However, the arising question is in fact not why was there a preference for the areas north of the river, but why wasn't there a similar preference for areas south of the river? The coastline south of the river has the same richness of kaimoana, there are the same navigable waterways through the dunes, and there are the same pockets of wetlands providing diverse resources. The reasons for this preference are not clear. There

may be an intangible reason, such as the river marking a rohe boundary. Research themes and questions postulated for the project can be considered in light of the information gained from the project.

5.1. Living on the coast: The landscape and how people used it

The physical environment was the primary causal factor in influencing where people went, how they got there, what they found when they got there, and what they did when they got there. The nature of the physical environment and the forces that have formed it contributed to what resources would be available and how people could obtain these resources, and also limited some opportunities and activities. Thus, archaeological site locations were in part prescribed by the environment – peoples' movement and activities were set by the opportunities and resources available in the physical environment.

The formation of the dune belts with intermediate wetlands has created an environment where the wetlands were previously navigable, allowing access throughout the dunes, and easy access to significant resources.

Although sites are found right along the coast, both north and south of the Waikanae River, there appears to be a preference for the environment north of the river. There is a greater density of sites here, and the middens here tend to be larger and more diverse in composition than the south of the river. The reasons for this are not clear. The shellfish resources are found right along the beach, not just in locations north of the river. There were also wetlands south of the river.

The question posed is in fact not why was there a preference for the areas north of the river, but why was there not a similar preference for areas south of the river, where there was the same access to the rich coastal resources. In other words, what sets the area north of the river apart? There may well be cultural reasons for this apparent preference, such as an historic rohe boundary, or an historic rahui on the area south of the Waikanae River.

5.2. Subsistence economy: resource availability and utilisation

In the broadest sense the resources of the coast and dunes were being exploited to consume elsewhere. As no-one appeared to be living permanently on the coastal dunes prior to the 1800s, the coast and wetlands could be regarded as the fish and meat aisles of the supermarket – people were travelling to the area specifically and only to obtain these resources.

The resource exploitation model presented on the basis of the archaeological suggests:

- The rich shellfish beds and fishing grounds provided huge and reliable resources
- People were coming to the area by waka, going to the beach and undertaking large scale fishing and shellfish gathering expeditions. Some fishing trips would have been into open water, and some may have gone via Kapiti Island to obtain rocky shore resources available there.

- The people would have then moved inland, possibly via waka moving through navigable waterways to deliberately utilise inland areas of wetlands with resources of birds, eels and flax
- They would have set up temporary camps on the inland dunes, to process fish, shellfish, birds and eels so as to discard the unwanted elements, and to harvest flax to make containers for the food. These temporary camps reflect the conclusions reached by Beckett, when he described sites, he recorded as fishing and food gathering camps. Carkeek noted that shellfish was often dried on strips of thin flax to store for later use; the presence of "fire features" (a site where a fire has deliberately been constructed but the absence of greasy sand suggested the feature had not been used for cooking) beside or near middens would appear to support this as an occasional food preservation technique.
- They appear to have steamed open the shellfish, and then dried the meat on flax lines or smoked it over fires to preserve it for travelling
- The people were also enjoying a range of other food available locally – a large variety of fish, birds, and a small number of mammals
- The people would then have left the area by waka, returning to their home fires
- The navigable waterways provided quick and easy access along the coast and within the inland wetlands. Being able to transport the food resources by waka enabled the people to gather and transport vast quantities of resource at a time. People therefore travelled considerable distances inland, travelling further and with greater quantities of food than if they had been on foot
- People were not gardening on the coastal dunes, simply because it would have been both difficult and unnecessary. Clearing of vegetation for a garden area would have resulted in the dunes becoming unstable and deflating. People may have been travelling from areas of stable gardening soils, and were making short visits to the coast specifically to obtain protein resources, so gardening in this protein rich gathering area was not necessary.

These marine resource gathering expeditions may have been comprised of large groups of people, implying social organisation and mutually agreed strategies and roles for those involved, or smaller whanau-based groups. Further, the presence of lithic material sourced from outside the Kapiti area suggests direct or indirect trade of resources.

There appears little evidence for Adkin's early and late dichotomy, on the basis of radiocarbon dates. The majority of dates for middens cluster in the sixteenth century. It may be, however, that the geographic location of the expressway route did not allow sufficient scope to test this: the route was largely located midway between the beach and the inland hills, so in "mid age" dunes, that is, dunes that are not the youngest or the oldest on the coast. However, one cluster of middens located well inland are noted, being sites R26/ 608, 609, 611 and 612. These are the most inland sites recorded in the M2PP archaeological programme, and are about 300m from the inland wave-cut cliff. These sites were not notable or distinctive in nature, constituent elements or age; R26/612 returned a date that fell in the mid-16th century, suggesting

these inland sites are no earlier than other sites on the coastal dunes. However, Adkins early/late dichotomy cannot be discounted on the basis of the M2PP archaeological data; additional research is needed in locations deliberately selected to test this hypothesis.

No evidence for pre-European gardening was recorded during the M2PP archaeological programme.

There are two possible reasons for this:

- The dynamic nature of the dunes meant that starting and maintaining a garden was difficult. Contemporary experience shows that the dunes start shifting as soon as vegetation is removed
- The richness of the sea-based resources may have meant that gardening was simply not necessary.

This observation of lack of gardening can only apply to the coastal dunes within the expressway route. It is possible that gardening was taking place on the hillslopes to the east. The area of what is now Waikanae town, east of the railway lines, is a potentially ideal location for gardening – the slopes are gentle in aspect, there is close proximity to water, the slopes are north facing, and the soil would be renewed by periodic slopewash from the hills above. Aerial photos from the 1940s and 50s (prior to large scale urbanisation of Waikanae) were viewed by the Project Archaeologist to test this hypothesis; no evidence of gardening was apparent.

It is noted that "gardening" or "horticulture" is noted as land use in many of the historic survey plans, in areas occupied by Māori. This report postulates that the crops being grown in these areas may have been European introduced crops, such as wheat or potatoes. The survey plans, and thus the observations noted on them, were compiled after the introduction of these resources on the Kapiti Coast from the 1820s, and the increasing trade opportunities provided by transport networks, especially the train in the late 1880s, would have provided demand for these goods.

This lack of gardening is a potentially significant research theme. It may well be related causally to the lack of permanent settlement prior to the 1800s – difficulty in establishing gardens reduced the incentive to create permanent settlements, and without gardens there was no need to stay permanently. The orthodox model for New Zealand prehistory has gardening as a later subsistence activity replacing earlier archaic megafauna exploitation. There is a strong correlation between gardening areas and defended sites: gardens and their resources were worth defending. On the Kapiti dunes, however, the lack of gardens resulted in a lack of associated permanent settlements, and a lack of earthworks sites such as pits and pa. This reflects both the limitations created by the physical environment, and the human response to these limitations – people did not need to establish gardens and settlements in areas where it was just too hard.

5.3. Shaky isles: the physical landscape, geomorphology and seismicity

The three key environment factors that shaped the environment – the Waikanae River, coastal currents and the wind – created an environment of coastal sand dunes interspersed with wetlands. A variety of resources were thus available from both the coast and from the inland wetlands. The network of interconnected wetlands facilitated easy movement from the coast to the wetlands, and within the wetlands, allowing exploitation of resources on a large scale. Using waka for transport of resources meant that people could take more of a resource than a person on foot would have been able to carry. Processing of resources on site also meant that unnecessary weight was discarded, further increasing the volume of food that could be transported.

The relationship between site locations and the environment is seen when sites are plotted onto a topographic plan. Sites are located solely within the dunes, and on dunes adjacent to current or previous wetlands. The evidence for these wetlands is seen in the gleyed sand present at the base of each one, below overlying dry orange-brown sand indicating previously waterlogged sand.

The previously navigable wetlands are now drained. Some have been drained for farming purposes, but many have not, as they are not located within optimal farming environments. The geomorphological data suggests a major seismic event some time after the 16th century causing uplift and draining.

McFadgen (McFadgen, 2010) has recently postulated seismic activity as a major landscape factor on the Kapiti Coast. He suggests that the Kapiti Coast has experienced several earthquake episodes, possibly with accompanying tsunamis, both before and during the time of human occupation. Effects on the human population from earthquakes and tsunamis may have included: uplift draining swamps and lagoons, destroying habitats of food-source birds and animals; gardens and living areas buried by landslips; inundation of gardens by water-borne salt and debris; sandwash down rivers changing river alignments and blocking estuaries; and sandwash smothering shellfish beds. This hypothesis has yet to be tested by archaeological and geomorphological data.

5.4. Looking at New Zealand: regional and national context

No sites with early dates or archaic style material have been found on the coastal dunes. The vast majority of radiocarbon dates occur from the mid-16th century. This suggests that the was a period of about 300 years (from the mid-16th century to the 1800s) when people were travelling periodically to the coast for the "trip to the supermarket". No evidence was found of resources such as megafauna (seals or moa) to attract people to the area any earlier.

In their report the SPAR team refer to the classic resource depression model that has been developed to explain significant changes over time in the New Zealand faunal record (Brooks, 2016:123). Something slightly different appears to be taking place on the Kapiti Coast. There was not a move from one resource base to another, in other words, from high value faunal species such as moa or sea mammals to shellfish. Rather, there appears to have been a steady and consistent preference for the specific resources available on the coast, but this preference has been exercised only from the mid-16th century. Preliminary data suggests

that there was not a drop in diversity of species, but further research is needed to examine this. However, contemporary observations attest to the diversity of shellfish species currently available on the coast, suggesting that overexploitation was not an issue (Yolanda Vogel, personal observations expressed to author, August 2018).

The model for the Kapiti Coast appears to be one of environmental niche maximization. Specific resources available abundantly were being exploited, whilst other typical subsistence activities (gardening) were not being undertaken. This was not a group of marginalised people subsisting on diminished resources. This was a group of people enjoying the best of the area, whilst avoiding the limitations.

6. Further Research

Whilst the M2PP archaeological programme gathered a great deal of data and has enabled the formulation of a regional archaeological statement, there are research themes that remain unanswered or unexplored.

- Is there evidence for Archaic sites in areas outside the expressway route? Can it be firmly established that there was no Archaic occupation of the coastal area? Has coastal erosion removed evidence?
- Is there evidence for archaeological hunting and processing of moa? Were moa present on the coastal dunes? Or were bones from moa that were hunted in the adjacent hills brought to the coastal area to make into tools?
- Does Adkin's Horowhenua-based model of the characteristics of early and late middens apply on the Kapiti Coast? The middens recorded along the expressway route fall into a tightly bracketed time period; it may be that middens located further inland are older, and have differing characteristics to more coastal sites, in line with Adkin's model
- Was gardening being undertaken on the slopes adjacent to Waikanae township?
- What is the evidence for seismic activity on the Kapiti Coast, and how might this have affected the population? McFadgen postulates subsidence on the coast (McFadgen, 2007); however, the geomorphological evidence and site/environment relationship suggests uplift some time in the period of human occupation
- Was there a drop in diversity of species, as postulated in the classic resource depression model? Analysis of younger sites would be required to explore this.
- Why does there appear to be a strong preference for areas north of the Waikanae River? Is there an environmental reason for this, or perhaps a social or cultural reason, such as a rohe boundary?
- A larger research theme is where were the occupants of the Kapiti sites coming from. This report postulates they were travelling to the coast from elsewhere via waka to exploit the resources. This suggests that they were coming from a location far enough away to justify travelling by

> waka and carrying large quantities of resource at any one time. It is also reasonable to infer they were coming from a location that did not enjoy large kaimoana (especially shellfish) resources.

Because the designated road alignment had remained unmodified, landscape and archaeological features were largely intact, the construction of the MacKays to Peka Peka Expressway presented an unprecedented opportunity to undertake the first piece of systematic archaeological research on a regional scale on the Kapiti Coast.

The data set gathered represents a comprehensive, robust and accurate model of the site distribution pattern, and exploitation or not of different environmental locales.

Some fundamental research questions posed prior to this body of work were: How were people living on the Kapiti Coast? What was their nature and quality of life? Did this change over time, and if so, how and why?

Data is now available to begin to address these questions. For the first time, therefore, a research-based statement as to the nature of the archaeology of the Kapiti dunes is possible.

People were not living permanently on the coastal dunes, but travelled to them and through them using the extensive navigable waterways that existed, specifically to gather the marine resources available. The rich resources of the coast enabled groups to gather huge amounts of kaimoana, which was carried to camps in inland dunes to be processed. These inland dunes, beside wetlands, also provided additional forest and wetland resources. Moving by waka facilitated travel throughout the wetland network, and allowed transportation of very large amounts of food and resources. People were not gardening on the coastal dunes, both because there was no need due to the rich coastal food resources, and because of the difficulty of maintaining a garden on the dynamic dunes. People also were not living permanently on the dunes prior to the early 1800s, and instead travelled to the coastal dunes from elsewhere to exploit the resources. Trade networks were established with other groups in the North and South Islands.

Occupation on the coast did not commence until the mid-16th century. There is no evidence of Archaic occupation on the coastal dunes, and no robust evidence for moa hunting on the coastal dunes (although moa may have been present in the adjacent hills).

The physical environment was the determining factor for the nature and location of archaeological sites. There is a fundamental causal relationship between the environment and archaeology: the environmental factors of the wind, coastal currents and the Waikanae River created the physical environment, and the physical environment in turn determined the types of resources that were present and thus determined the types of archaeological sites present, and where they are found across the landscape.

The M2PP archaeological programme has contributed significantly to a developing regional synthesis of archaeology on the Kapiti Coast and has filled a gap in the archaeological record of New Zealand.

The M2PP Expressway completed in 2017 is in many ways the second expressway on the Kapiti Coast – the first was in use some 500 years ago but was formed not of earth but of water.

Supplementary Materials

The supporting information can be downloaded at https://doi.org/10.70460/jpa.v15i1.377

S1: Size of M2PP Middens; S2: M2PP C14 results; S3: Artefacts.

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Data Availability Statement

Further data is available from the author (O'Keeffe, M. mary@heritagesolutions.net.nz)

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The indigenous community was involved in the fieldwork undertaken for this project, and in discussions on the analysis of the data.

Conflicts of Interest

The author declares no conflicts of interest

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